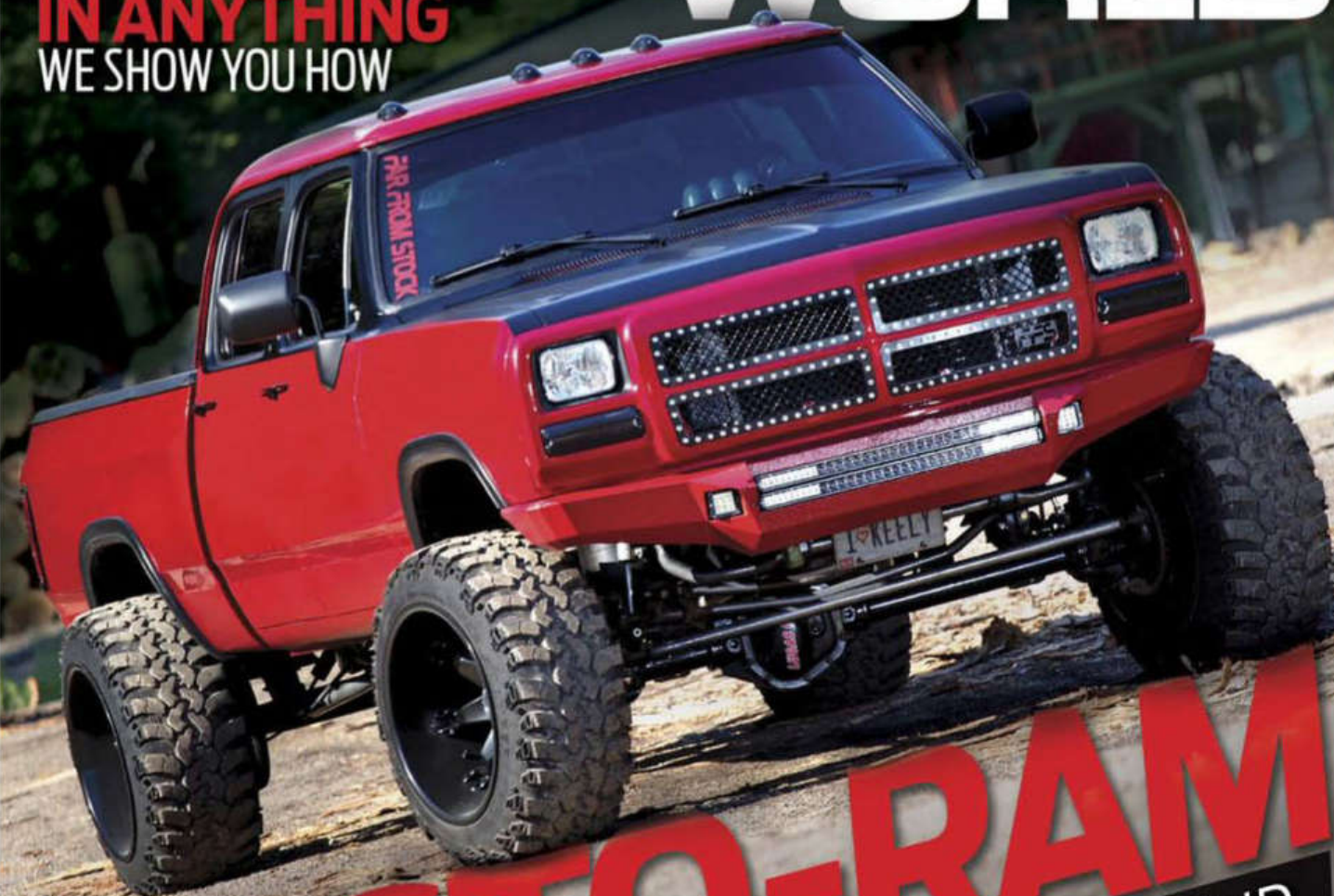


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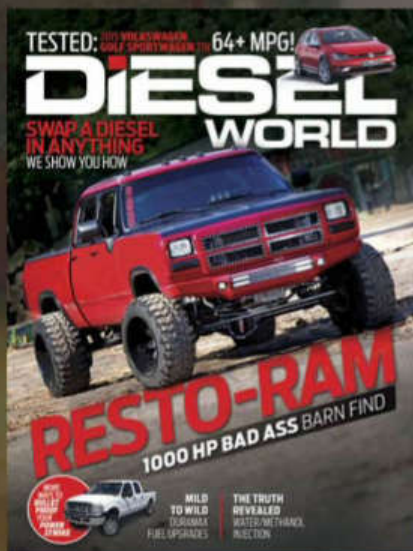
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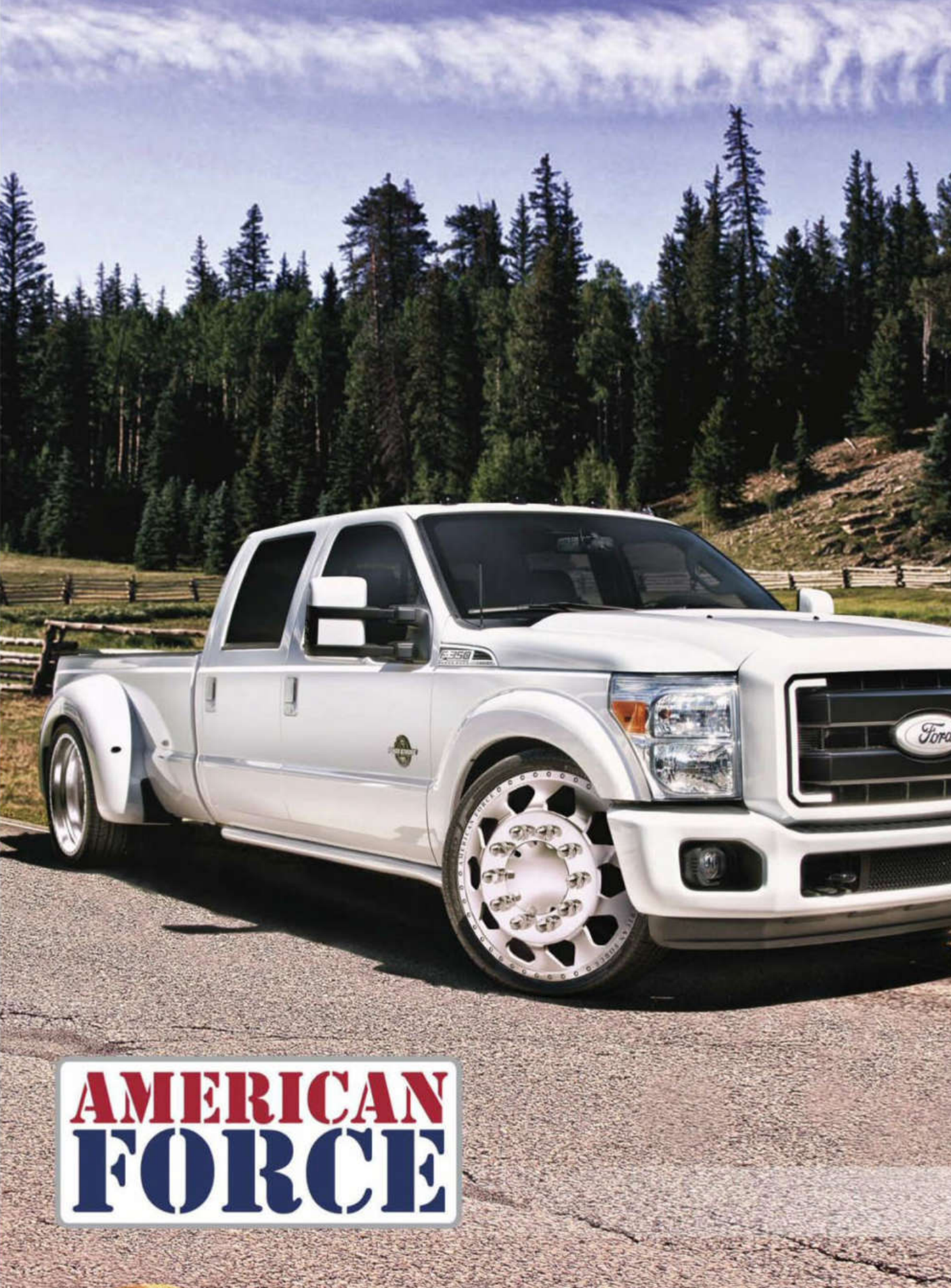
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# Diesel Conversions

## And Aftermarket Industry Support

BY ADAM BLATTENBERG

**A**s diesel continues to grow in popularity, the availability of used diesel engines grows as well. While you can pick up a decades-old 6BT Cummins for a few thousand bucks, getting your hands on a cheap 6.7L Power Stroke that's only been out for a few years is a different story. Not enough of them have been wadded up or worn out yet (unfortunately, many used engines become available via wreckage of some sort) so the used 6.7L Power Stroke engine market is fairly small. Even if you could find a pulled 6.7L Power Stroke for cheap, you're not going to find some-one that makes a stand alone harness and ECU for it. This makes them next to impossible to use in anything but the vehicles they were originally intended for because newer engines are designed to work side by side with other systems in the vehicle. Oddly enough, that's the beauty of the aftermarket. As engines become readily and cheaply available, the aftermarket takes notice and begins to build parts to help automotive enthusiasts swap these now surplus engines into whatever project we can think of.

Painless Performance was probably one of the first larger companies to offer a standalone wiring harness for the 5.9L Cummins. Many don't know this but their 5.9L harness can also be used on a 6.7L Cummins with a few small modifications. Standalone harnesses are also available for the Duramax from a few companies with one being Pacific Performance Engineering. The Duramax however needs more than just a harness to run outside of its original GM home; it needs special programming, which can be done in multiple ways (for more on these harnesses and the computers needed to control the engines see our Diesel Conversion Builders Guide on page 90). These harnesses came out years after the engines were offered from GM or Cummins, and it's because of these harnesses that we can slap a Cummins in a Ford, or a Duramax in a boat, for example. Without these harnesses, getting the electronics figured out in a diesel swap would be extremely time consuming and in some cases, not possible at all.

I've personally been looking to swap a smaller diesel into my off-road project since I picked it up six or seven years ago. It's a smaller, late-model Ford Ranger, so using a 5.9L Cummins or Duramax is out of the question. They're too large to fit properly, and they're simply too heavy to keep weight bias close front and rear (without doing extensive body work). I've looked



into using a 4BT since they're extremely easy to wire up, but I've decided that getting on and off the throttle constantly, as I would need to in the dirt, would beat up on the heavy rotating mass (crankshaft, pistons and rods) more than I feel comfortable with. Kubota's and VW TDI engines are also options, and they do have an aftermarket wire harness backing, but they lack in the horsepower department (and would also take a beating under the aforementioned conditions). What I've been waiting for came out in the US market a few years ago in the form of the 3.0L EcoDiesel. It's the engine offered recently as an option in 1500 Rams but is also found in Grand Cherokees. Swapping it in will only require a bit of fabrication as, amazingly so, there is already aftermarket wiring harness support for this powerplant from Banks Power. This engine (made in Italy by manufacturer VM Motori) is a step away from conventional thinking when it

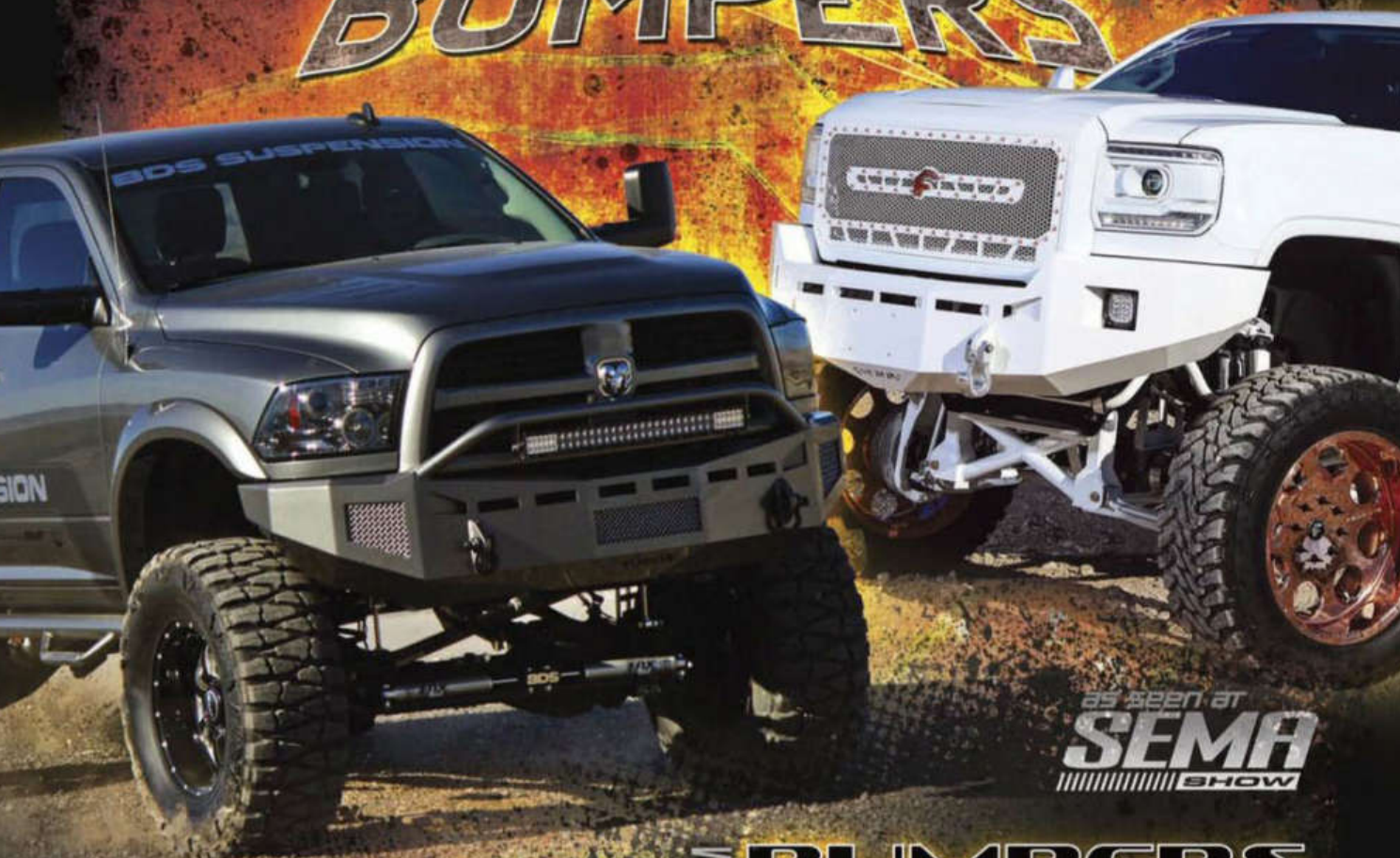
comes to building a diesel engine. The rotating mass is extremely light, making it respond more like a gas engine, while still offering the torque and economy of a diesel engine; therefore, making it perfect, in my mind, for a project such as mine. After a few light tuning tweaks, it should make around 300 hp and 500-plus ft.-pounds of torque. In a 4,200 pound truck—that's not a bad combo. It's not huge power, but it'll be reliable, economical and still have more than enough oomph to easily get the truck out of its own way.

Unfortunately, they're still too new and are rather expensive on the used market, though they are starting to show up in wrecking yards around me more and more. Maybe in the next couple years there will be more of a surplus around, and I will finally have my EcoDiesel-powered Ford Ranger. Rest assured, we'll share all the details of that swap here in Diesel World. **DW**

-Adam



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## Mercedes-Benz Sets New Pikes Peak Record for Diesels

In this year's legendary Pikes Peak International Hill Climb, a "near-production stock" Mercedes-Benz C250d set a new record for diesels. Modifications to the vehicle were minimal and consisted of disassembly of the interior (typical for racing cars), as well as regulation safety modifications including a rollover cage, racing tank, fire extinguishing system, enhanced brakes and ultra-high performance (UHP) tires.

The C250d completed the 12.4-mile all-uphill course in 11 minutes and 22 seconds. In addition, this was done at almost 5,000 feet of altitude. This proves that the torque of a small diesel more than makes up for raw horsepower: The small 2.1L diesel makes only 201 horsepower, but it has an impressive 369 lb-ft of torque that proved more than satisfactory. While the C250d most likely will not be released in the US, a larger diesel is expected in a C300d early next year.



## Ram Truck Recall Update

FCA US (Fiat Chrysler Automobiles) has clarified the scope of the NHTSA (National Highway Traffic Safety Administration) Consent Order. The following is an excerpt from the FCA US statement:

"In the consent order, FCA US has agreed to additional remedies for three recall campaigns covering approximately half a million vehicles, primarily 2008 through 2012 chassis cab, 2009 through 2011 light duty and 2008 through 2012 heavy duty Ram Trucks. In each of those campaigns, FCA US will offer to owners whose vehicles have not yet been remedied, as an alternative remedy, to repurchase those vehicles at a price equal to the original purchase price less a reasonable

allowance for depreciation plus ten percent. However, customers responding to the recall may continue to keep their vehicles and have them repaired in accordance with the original recall. As of this date, repairs have been completed



on well over 60% of the subject vehicles, leaving less than two hundred thousand eligible vehicles. As is expressly provided for under the consent order, FCA intends that any vehicles repurchased will be remedied and resold."

If your truck's issues were not yet addressed by the dealer, you can have the updates made to your truck, or you can sell it back to the factory at a price they determine. Original owners with the same mailing address will likely get this information in the mail. Of course, you can also see your local dealer for details regarding your truck's eligibility for the recall offers.

**All the Diesel News That's Fit to Print... and Some That Isn't.**



# Land Rover Offers Diesel in USA

The rumors are true: Land Rover has now officially announced that the 2016 lineup for the US market will have a diesel option.

A new 3.0L turbocharged V6 diesel engine will be introduced for the first time in the North American market - making its debut with the 2016 Range Rover and Range Rover Sport models. The Td6 engine produces 254 hp and 440 lb-ft of low-end torque



maintaining the 7,716lb towing capacity of most Land Rover vehicles. Providing exceptional levels of efficiency and refinement, the Td6 engine, when equipped on the 2016 Range Rover and Range Rover Sport, delivers an estimated 22 mpg city, 28 mpg highway and 25 mpg combined, representing a 32-percent improvement over the gasoline powertrain.

## Mazda Diesel Earns Top-Five Finish

Driver Joel Miller took the checkered flag at the Watkins Glen International racecourse after completing 144 laps and moving the Mazda diesel-powered Prototype team into fifth place.

Fifth is the best-ever Prototype class finish for the 2.2-liter SKYACTIV diesel engine in the TUDOR United Sports Car Series. While Joel Miller finished the race with two hours of seat time in the rain, other team members contributed too: Tom Long drove the opening segment, and Ben Devlin was in the seat for the middle segment.



## Climbing GM Sales

General Motors has reported that sales of Chevrolet and GMC trucks are at its best since March 2007. Chevrolet had its best March pickup sales since 2007 with a 7-percent increase in Silverado sales, and the new Colorado reclaiming the industry's fastest-selling pickup for the second month in a row.

Overall, GMC had its best first quarter sales since 2005 and its best March pickup sales since 2006, with Canyon deliveries reaching 2,434 units and Sierra climbing 3 percent. (Approximately 40 percent of Sierra customers purchasing heavy-duty models are choosing the high-end Denali trim series.) This has helped Sierra earn the highest average transaction prices for any full-size pickup line. As of March, actually, commercial deliveries have grown year over year for 17 consecutive months. **DW**





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ATS also designs and manufactures certain parts for off-road and race use only. These parts are not intended for sale in any state, including California, where the items do not comply with local rules.



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# ONE OF A KIND

Bill Cielo's 450 hp Duramax-Powered '58 Chevy Apache

TEXT AND PHOTOS BY JASON SANDS

**W**hen we first spotted Bill Cielo's '58 Chevy pickup at a local dyno event, we literally ran over to see if it was diesel powered. As luck would have it, the truck was indeed a diesel, as the cleanest LBZ Duramax engine we've ever seen was crammed under the stock hood. To make things even more interesting, Bill told us the Chevy was a mix of parts from the original '58 (including the rear frame), and a later '06 Chevrolet donor truck. Like almost all cool builds, Bill's started out with an idea, and a story.









## LUCKY FIND

A fabricator by trade, Bill always had wanted to own a diesel swap, and when he came across a wrecked '06 with only 30,000 miles on the clock, he knew he had to have it. After Bill bought the truck, he still had no idea what the drivetrain would go into, but he wanted it to be a classic. A short while later, Bill ran across a '58 Chevy Apache pickup truck that had

been sitting in a farm shed since the mid '80's. The wheels started turning, and the idea to build an astoundingly cool parts-chasing shop truck solidified in Bill's mind, and he got to work.

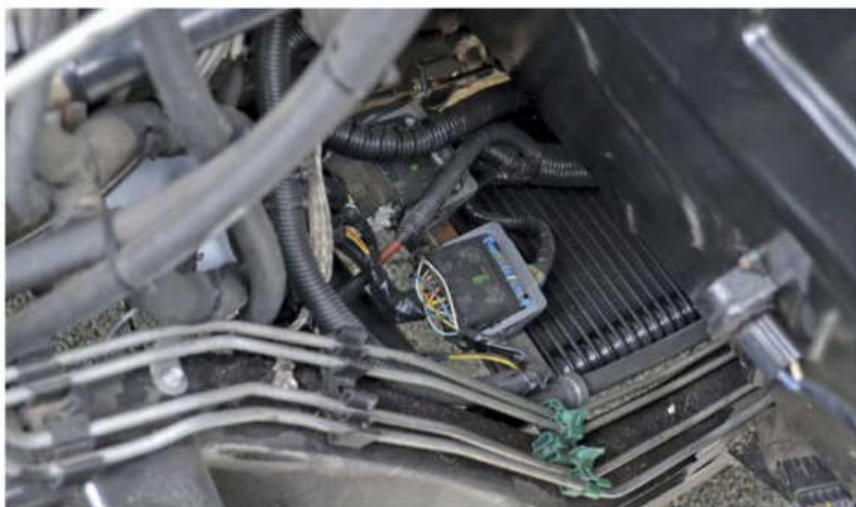
## FRANKEN-CHEVY

Virtually every part of the '58's front end would need to be modified to fit and support the diesel, so Bill made the deci-

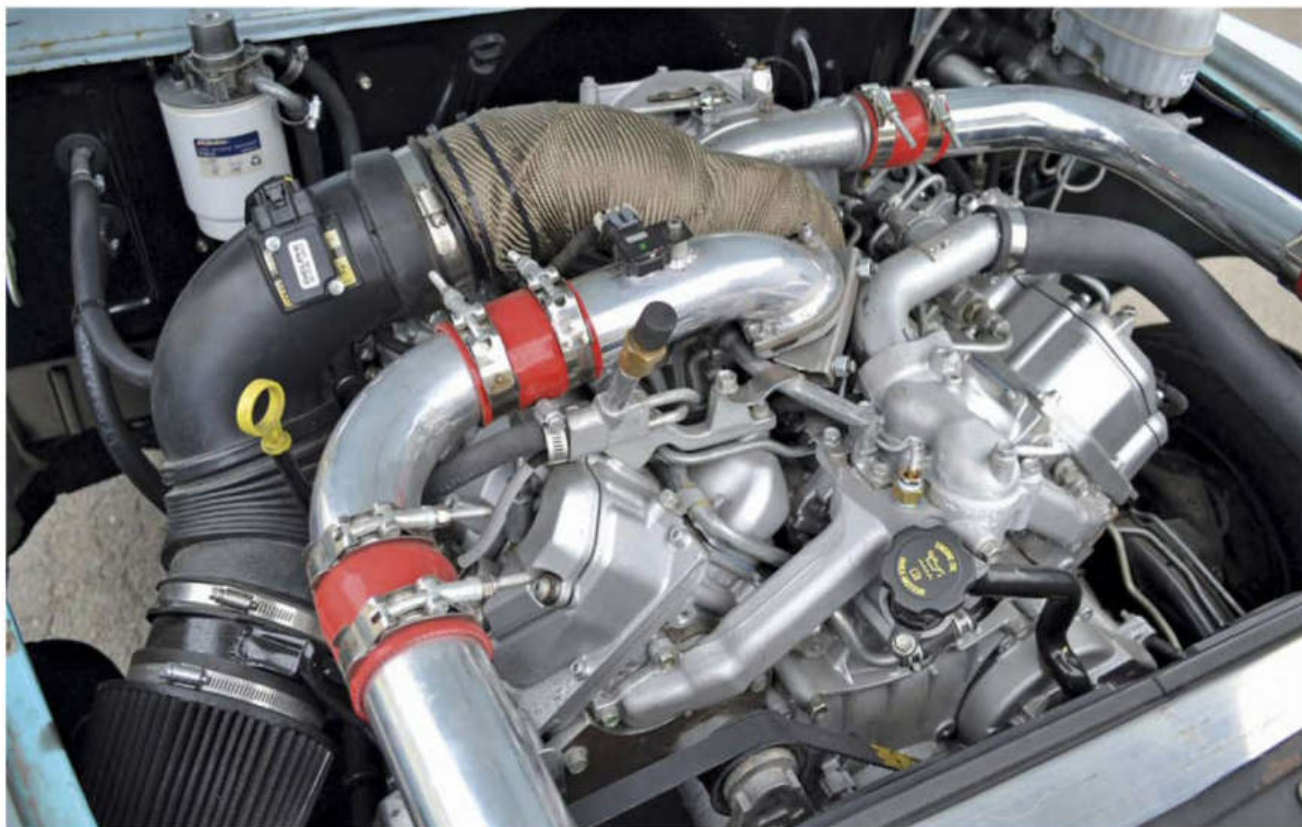
sion early on to use the complete front half of the '06 Chevy's chassis. After eyeballing everything in a mock-up stage, Bill sent the Duramax's wiring harness off to Pacific Performance Engineering (PPE) to be stripped of everything that wasn't essential to keep the engine and transmission running. Bill also never liked the look of the Duramax engine's multiple comput-

ers, so he spent "the better part of a

# ONE OF A KIND



It took us a second to realize why Bill's engine looked so much different than a normal Duramax. A big part of cleaning up the engine bay was relocating all the computers to the drivers' side floorboard, which Bill accomplished by painstakingly lengthening every single wire.



Underneath the hood of the survivor '58 body is perhaps the cleanest Duramax engine bay we have ever seen. Bill took great pains in making the 6.6L engine look as smooth and simple as possible. With a PPE Hot+2 tuner, it also puts out an estimated 450 hp and 900 lb-ft of torque at the rear wheels.



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The rear of the truck is all original Chevy, save for the massive 25-gallon fuel cell that adds some traction, and range. At nearly 25 mpg, Bill figures he can go nearly 500 miles without refueling.



The wood in the bed is the same as it was in the '80s when the truck was built, and has held up remarkably well over the years. Even though it might not be as tough as steel, Bill just didn't have the heart to replace it.

## "BILL RAN ACROSS A '58 CHEVY APACHE PICKUP TRUCK THAT HAD BEEN SITTING IN A FARM SHED SINCE THE MID '80'S"





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week" painstakingly extending every wire to relocate everything down by the driver's side fender well of the truck. It cleaned up the engine bay immensely, and at the time, Bill didn't even know if it would work. Bill said: "A lot of people said lengthening all the wiring would mess up the computer system, but I knew the only way to find out was to just try it."

Since the rear part of the frame and bed was in such good shape, Bill decided to retain the factory '58 rear chassis including the bed. Since Bill builds racecar chassis on a regular basis, he was able to graft the back half of the '58 on to the front half of the '06 with no problems. In



A universal air filter "of some sort" was another used item, which gets the job done as far as airflow into the turbo goes.



The hydroboost braking system was adapted to the '58 Chevy's body when Bill did the swap so that he could actually stop. A driver's side exhaust manifold from Pacific Performance Engineering was also fitted at the same time to improve airflow to the turbocharger.



An aluminum radiator designed for a Big Block Chevy performs the cooling duties, along with twin electric fans. Bill reports that the engine "Doesn't get hot, anywhere, ever," which he noted was a perfect feature for a parts-hauling truck.



The stock Garrett turbocharger has been upgraded with bright red silicone boots and a heat-wrapped intake, but otherwise is stock, and puts out 25 to 30psi of boost.



The engine is actually intercooled, and incorporates a piece that Bill bought off of Craigslist for 25 dollars. So far it's worked flawlessly and has been able to fit behind the grille of the '58 with only minor modifications performed.





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Normally a turbo downpipe is a pretty tight squeeze in a swap, but the engine bay of the Apache actually had a lot of room. Bill made up a 4-inch downpipe, which then attaches to a 4-inch exhaust that runs the length of the truck.



Another addition to the engine bay that helps out in the looks and power department is this low-mount drive bracket that Bill came up with. It deletes the A/C and also moves the steering pump down lower, so more of the engine is visible.



The massive AAM 1150 rear-end with 3.73 gears was taken out of the wrecked '06 Chevy and transplanted into the '58 Apache. Bill did the integration himself, including the mounts, traction bars, and rear airbags for heavy loads.



Simple oil, water, and voltage gauges are the only one found on the truck. Since Bill rarely goes past Level 3 with his programmer, he never felt the need to install a boost or EGT gauge.



We've seen a lot of frame-chops on swapped trucks that are simple boxed connections, but since Bill is a chassis guy, he made sure he did his right. An added crossmember and boxed and triangulated reinforcements minimizes twisting or flexing action due to the diesel engine's torque.



Everywhere you look, there are little things that Bill did to make his truck unique. Since Alcoa doesn't make a 19-inch rim, Bill had 19.5-inch wheels turned down to 19s and then wrapped in 245/45/19 Z-rated Hankook Evos, which allows for occasional 130 to 140-mph blasts.

fact, with triangular bracing, boxing, and an added cross member, it's probably the strongest part of the entire frame. With a complete chassis, the rear-end of the '58 had to be addressed, as there was no way it would be able to take the torque of the diesel engine. Bill again turned to his '06 for a rescue, and built a rear suspension

setup around the 3.73-geared AAM 1150 rear-end with the factory '58 leaf springs, some Rancho 5000 shocks, and airbags he picked up from Craigslist.

It's been more than a year since Bill morphed two Chevys into one badass ride, and he's had no issues with enjoying it since the day it was finished. "With a 25

gallon tank I can run almost forever, and even with the PPE tuner on level three, I have no issues keeping up with new Mustangs and Camaros," reported Bill. Best of all, the 4,600-pound truck is still used for its intended purpose, a cool and unique parts-chaser, that turns heads (and tires) wherever it goes. **DW**





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# One Tough Tranny 2

## Installing our Better than New 4R100

TEXT AND PHOTOGRAPHY BY TRENT RIDDLE

In our last issue, we had Remac Transmissions, in San Dimas, California, go through a Ford 4R100 auto trans to make it better than new. This time, we will be installing that beefed-up trans so that our F-250 shop truck will be able to safely perform a multitude of tasks, from moving parts to towing trailers of all sizes. However, before that can happen, the better than new automatic needs to be installed.

While installing an automatic transmission may seem a simple task, each vehicle and transmission type has some unique aspects to consider. For example, this installation will take place in a 4x4 with a transfer case. If you have a high-milage truck, be sure to have the T-case inspected and if needed, have it refreshed too. We'll cover the basics for our vehicle, and provide a few tips and tricks along the way. This should help you if you decide to do a 4R100 replacement on your own Super Duty. **DW**



After a complete overhaul and some much needed upgrades by Remac, our better than new Ford 4R100 transmission is ready to install. Remac ships its transmission with a torque converter.

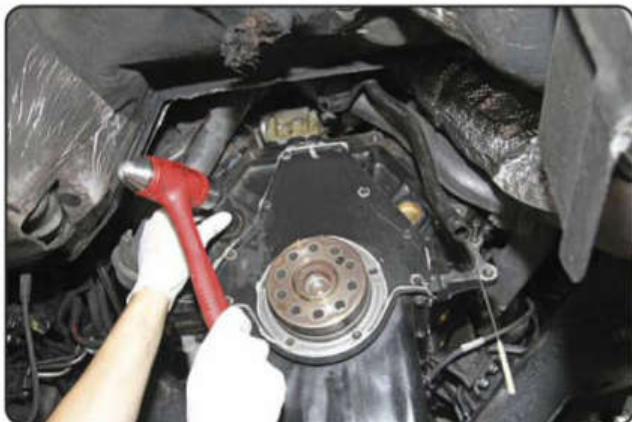


**1** While Remac ships its transmission with a torque converter that is prefilled with EOM spec transmission fluid, it is best to check it before installation to be sure it is topped off.



**2** The basic transmission will need to be bolted to the transfer case for our 4x4 Ford.





**3** The 7.3L Power Stroke, like most engines, has freeze plugs at the back of the block. They should be inspected and replaced if needed. Brass is preferable to steel for the freeze plugs. They won't rust out over time and hold better than steel, due to the greater differential in thermal expansion with the cast iron block.



**4** Ford used two different starters for the 7.3L engines. Early models used a standard starter and matching adapter. Seen here is the early model (1994-2000) version. The starter adapter ring will need to be changed to use the later model high-torque unit. While this 2002 originally had the high-torque starter and adapter ring, it was swapped out sometime in this truck's history. Either setup will work on the 7.3L Power Stroke engines. (Note the 1985-94 6.9L and 7.3L IDI units are different)



**5** The flex plate is bolted to the end of the crankshaft flange, after the starter adapter ring is installed.



**6** Flushing the transmission lines and transmission oil cooler is recommended, before the new transmission is installed.



**7** A tip for doing the transmission installation yourself: The fuel pump on the frame is easier to access with the transmission out. If your truck is a high miler, you might want to replace this pump now for added insurance down the road.





**8** The transfer case should be bolted to the transmission while it's outside of the truck. It is simpler to do this now than when installed in the truck with the floor-board in the way.



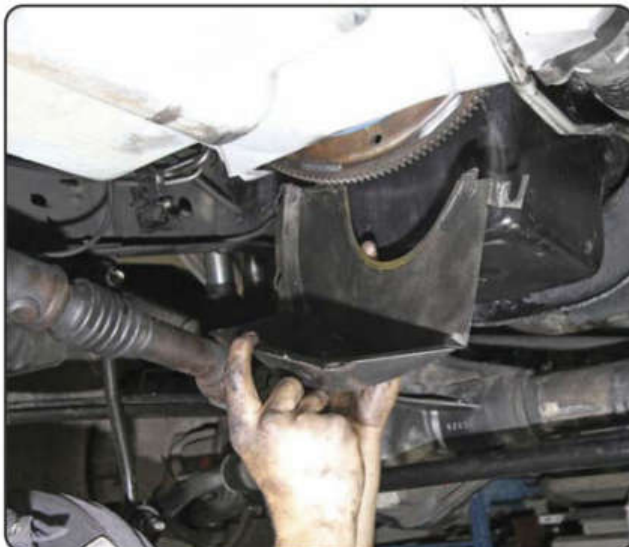
**9** The torque converter, after checking that it is full of fluid, is installed on the transmission input shaft. Look closely and you'll also see that the front driveshaft is bolted to the T-case, before installing the unit in the truck. This is said to be easier than bolting to the front output while in the truck.



**10** The transmission and transfer case assembly is lifted into the truck with the aid of a transmission jack. The unit is bolted onto the motor and the front driveshaft is bolted to the front differential yoke.



**11** The transmission mount is bolted to the back of the 4R100 transmission. This mount is then tightened to the rear transmission cross member.



**12** Always be sure to reinstall the dust shield at the bottom of the bell housing.



**13** The rear driveshaft is a two-piece unit with a center support bearing. Ours was well used and in need of repair. It was replaced with an all-new unit from J.E. Reel, which is better than stock.



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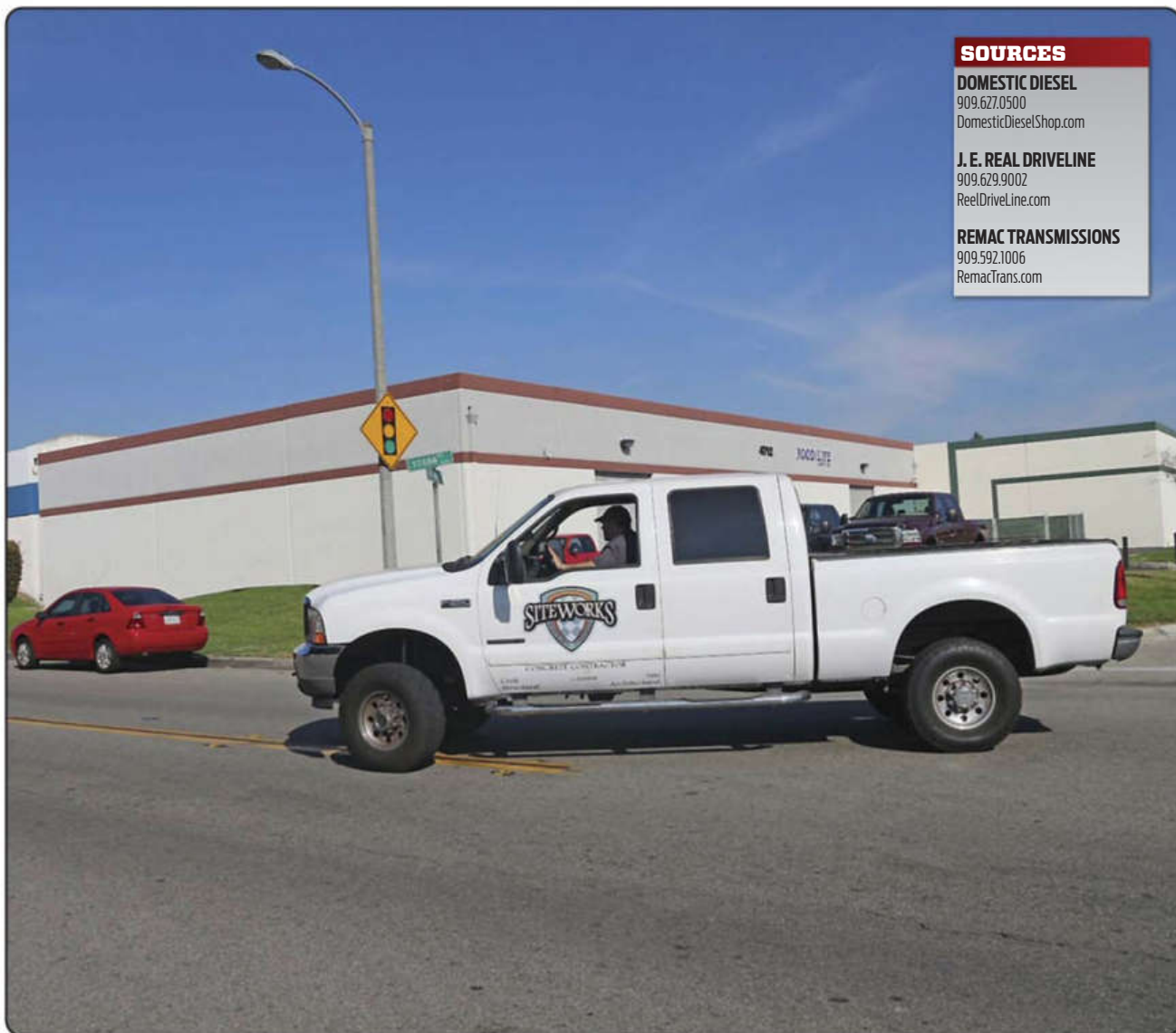




**14** If your truck has had the automatic transmission fail catastrophically, a new oil cooler is recommended. This and flushing the hard lines will keep metal shavings from the old system from contaminating your new setup. Here you see a larger transmission oil cooler from a 6.0L Ford being installed. (The June 2015 issue of Diesel World has more on this upgrade.)



**15** The transmission must be filled with 10 quarts of the correct type of automatic transmission fluid and then rechecked and topped off after starting the engine and putting the transmission in gear a few times to circulate the fluid throughout the system.



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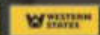
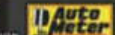
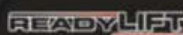
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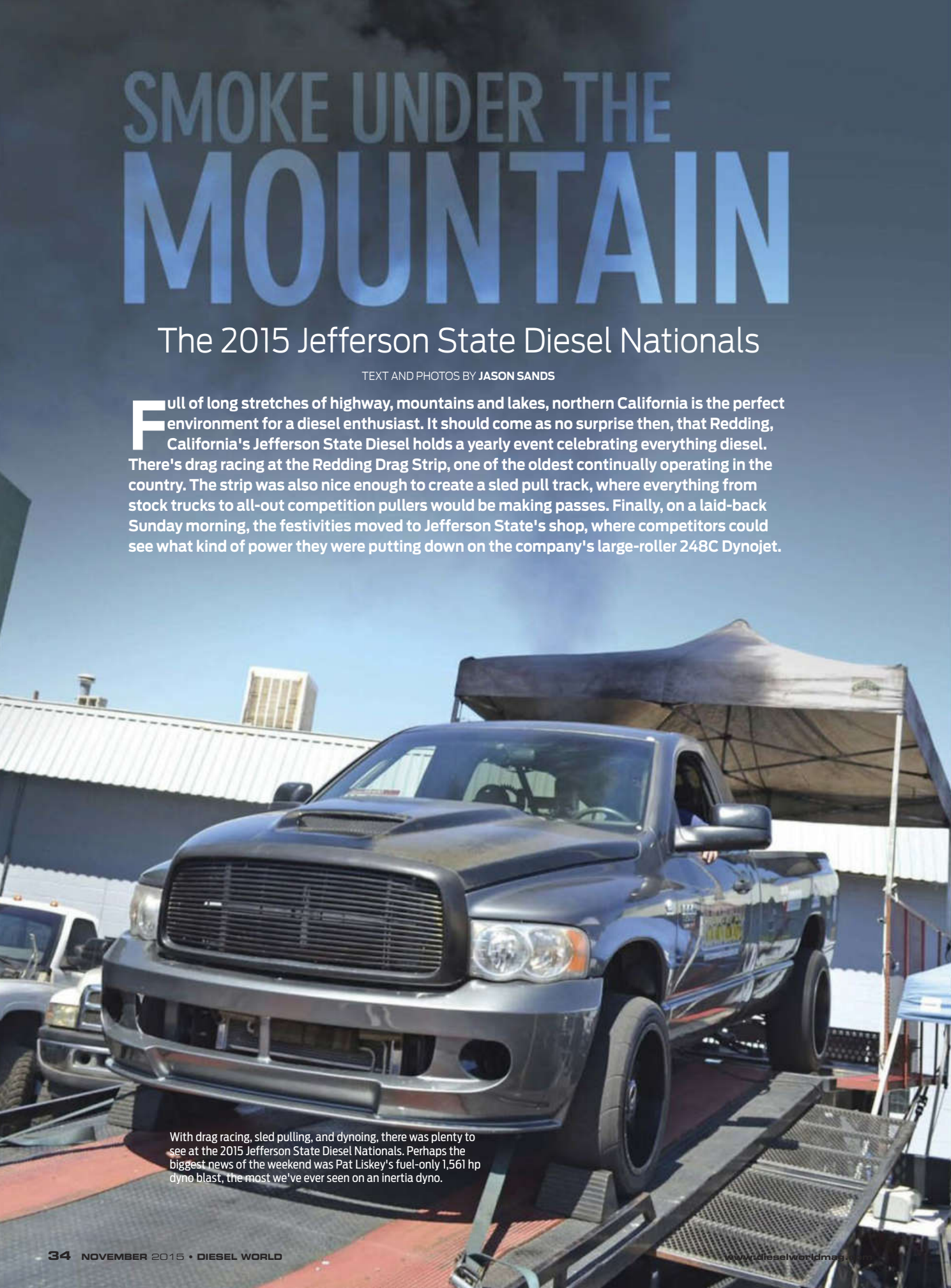


# SMOKE UNDER THE MOUNTAIN

## The 2015 Jefferson State Diesel Nationals

TEXT AND PHOTOS BY JASON SANDS

**F**ull of long stretches of highway, mountains and lakes, northern California is the perfect environment for a diesel enthusiast. It should come as no surprise then, that Redding, California's Jefferson State Diesel holds a yearly event celebrating everything diesel. There's drag racing at the Redding Drag Strip, one of the oldest continually operating in the country. The strip was also nice enough to create a sled pull track, where everything from stock trucks to all-out competition pullers would be making passes. Finally, on a laid-back Sunday morning, the festivities moved to Jefferson State's shop, where competitors could see what kind of power they were putting down on the company's large-roller 248C Dynojet.

A dark blue Ram pickup truck is positioned on a dynamometer (dyno) at an outdoor event. The truck is facing forward, and its front end is slightly elevated. In the background, there is a large white tent structure and a building with a corrugated metal roof. The sky is clear and blue.

With drag racing, sled pulling, and dynoing, there was plenty to see at the 2015 Jefferson State Diesel Nationals. Perhaps the biggest news of the weekend was Pat Liskey's fuel-only 1,561 hp dyno blast, the most we've ever seen on an inertia dyno.





One of the cleaner and faster OBS Fords in attendance was this two-tone red and white rig, which made pass after pass in the 13-second zone, and even competed in the sled pull later in the day.



Jay Lynch is proving to be darn tough to beat. In addition to winning the NHRDA's season opener in Bakersfield, he won the bracket class at Jefferson State too, taking wins in both Northern and Southern California.



At the pulls, a lot of the Duramax-powered trucks had their torsion bars cranked all the way out to give the truck a super-low stance. Since there's thousands of pounds of sled in tow, this actually brings the truck up to level once it's headed down track.

**"SOME OF THE QUICKEST VEHICLES WERE SWAPS, WITH BRAD PONCI'S S-10 AND RPM MOTORSPORTS DURAMAX-POWERED NOVA LEADING THE CHARGE"**

## CONSTANT ACTION

From Saturday morning to Sunday afternoon, the constant action kept crowds of fans entertained. Since rust isn't much of an issue in California, the scene was dominated by creative swaps and old-school rides. The number of old body style (OBS) Fords was impressive, with some running as quick as 12-seconds down the quarter mile. However, some of



Plenty of hot street trucks were there to hit the track, like Kat Ray's mildly modified Duramax, which went high 12s in Redding. Not bad for its limited modifications.



While waiting for the sled pulls to start, we got a chance to look at some cool engine bays. Joel Gooch from J&H Performance was nice enough to pop the hood on his ultra clean sled puller so that we could check out its p-pumped 24-valve power plant.



Perhaps the most impressive performance of the pull was put in by Les Szmidt, who used nearly 1,000 horsepower on a 2.6-inch charger to motivate his Dodge to a 338-foot pull and past the rest of the field by a good margin.



As the competition went on, we saw a number of interesting pairings, like this diesel street rod (known as "The Fodge") that lined up against a common-rail drag truck.



The heads-up class saw a final round matchup between Ponci's S-10 and Nick Zischka's Ram driven by Les Szmidt. To make things interesting, Brad gave Les a pretty good head start (on purpose) but still ran the Ram down, with a 141-mph trap speed.



Some competitors who had run at the track decided to test their rides on the dyno as well. This Dodge from Big Red Customs laid down close to 700 rear-wheel horsepower with a 73mm turbocharger and some 250 hp injectors from Industrial Injection.



The event started on Saturday with drag racing, and in the pits, we immediately spotted one of the most unique tow vehicles we've ever seen. Built by The House of Diesel, this 2015 Ford has been turned into an Excursion clone, complete with steel sheet metal and matching rear fender flares. Hey Ford, want to make one of these?





Capable of instant boost and big power, Brad Ponci's supercharged and turbocharged S10 ran mid 9-second passes all day, with an impressive 153-mph trap speed. The truck is powered by a Cummins 12-valve engine and features a monster 139-mm Procharger supercharger blowing into an 80-mm Gillett Diesel turbocharger.



Diesels usually have a heck of a time making full passes the first time to the track, but Aaron Flournoy was able to dip into the 10-second zone the first time out, with his 12-valve powered drag truck. With a best of 10.87 at 126 mph with a spinning 1.74 60ft, look for this Ram to dip into the 9s soon.



As the drag racing action begun, one of the rowdiest vehicles on the premise was this triple turbocharged nitrous-huffing 1973 Nova, which has run a best of 9.15 in the quarter. In Redding, the Nova slipped and slid to a traction-limited 10.0-second elapsed time, at a blazing 155 mph.

the quickest vehicles were swaps, with Brad Ponci's S-10 and RPM Motorsports Duramax-powered Nova leading the charge. On the sled-pull track, common-rail trucks took control, with the most impressive pull of the night belonging to Les Szmidi's '06 Dodge 2500, which took it out the door with a 338-foot effort.

## DYNO DAY

On Sunday, the dyno action consisted of mostly street-legal trucks, with a few notable exceptions. Wildman Pat Liskey from Big Twin Diesel brought his Ram race truck, which had split its block just weeks before but could still make a few



Ross Mulroney went 284 feet in the Street Class, after running 12s earlier in the day at the drag strip. There's no Cummins here, as the OBS 7.3L truck is still all Ford powered.



Jeremy Wright, one of the co-owners of Jefferson State Diesel, made an appearance in the Stock Class, where he finished mid-pack in his daily driven Ford.



Part of the fun of diesel events is seeing things like a triple turbo rat rod parked next to a brand new 6.7L Ford. Drag race, anyone?

Despite being older technology, this flatbed Ford made a strong showing, thanks to traction bars, aggressive tires, and a huge front bumper that served as a ballast.



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After the sled pulls, we took a quick tour around the pits to see if there was anything of interest. As it turns out: there was. This Cummins-swapped Chevy didn't only have the diesel power train upgraded, but both front and rear axles and suspensions were upgraded as well for extra abuse. At 5,500 pounds, it's also a good 1,000 pounds lighter than most diesels.



**"THE DODGE LAID DOWN A MAMMOTH 1,561 RWHP, THE HIGHEST NON-NITROUS NUMBER WE HAVE EVER SEEN ON AN INERTIA DYNO"**

dyno pulls. With an 80mm and 118mm compound setup and twin 12mm stroker CP3s, everyone was expecting big numbers out of the 5.9L Cummins, and boy were they right. The Dodge laid down a mammoth 1,561 rwhp, the highest non-nitrous number we've ever seen on an inertia dyno. While Pat was the big draw, there were a number of other trucks in the 500 to 800-hp range that were regularly street driven.

After all the diesel horsepower had settled down to an idle, everyone walked away with a sun-

drenched weekend of drag racing, dynoing, and sled pulling. And you know what? It doesn't get any better than that. **DW**



Adam Aquino (near lane) was shooting for 10s after dynoing a wild 920 hp to the wheels but ended up having to pedal the truck and ran in the low 11s (but at 123 mph). The Duramax-powered Chevelle in the other lane belongs to Rick Fletes and ran an impressive 11.7 at 115 mph on a bone stock engine with a tune!



Jeremy Torgerson was another Dodge owner who laid down some pretty impressive results. With compound turbos and some mild injectors, the Ram made 562 hp to the wheels on its tow tune, and 603 hp to the wheels on its all-out programming.



On Sunday, the Jefferson State crew hit the dyo for some high horsepower action. As it turned out, Pat Liskey pretty much stole the show with his common-rail Dodge, which put out a tremendous 1,561 rear-wheel horsepower.



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# Don't Break the Bank

## Affordable Duramax Fueling Upgrades

TEXT AND PHOTOS BY JUSTIN FIVELLA

**A**s with any diesel engine, more air and more fuel means more power. So naturally, the more fuel that trucks receive, the better. However, not long ago, the sentiment that more is better came back to bite some Duramax fans when they realized that nudging horsepower past the 400-hp mark produced diminishing returns, not because the almighty GM mill wasn't capable, but because it was being choked from a lack of fuel due to a few simple shortcomings.


Again, this isn't to say that the Duramax is an improperly designed motor, because they really are great performers out of the box. But as soon as diesel enthusiasts started wicking them up, it was immediately apparent that the factory fuel feed lines, pressure relief valve and CP3 just couldn't handle the load of a heavily juiced-up tuner.

Thankfully, Pacific Performance Engineering (PPE) engineered some affordable fueling upgrades that do wonders for modified trucks. This isn't to say they're not worthwhile modifications on a stock truck, but the return on investment will be

much larger with a truck already outfitted with a tuner, intake and exhaust upgrades that are already asking too much of the factory fuel system.

Take for example, Matt Kutchera and his LLY-equipped 2005 Chevrolet Silverado 2500 that was previously modified with a mild lift, upgraded rims and go-fast bolt-ons like a cold air intake, full exhaust and a combination of PPE and Edge tuning components. The truck was a great performer, but when loaded with his toy hauler, the truck would run out of steam on the steepest of hills.

Matt Kutchera's LLY-equipped 2005 Silverado 2500 LTZ is fully loaded, has ridiculously low mileage and is as clean as they come. Prior to our PPE fuel upgrades, the rig had full exhaust, a cold air intake and a combination of PPE and Edge tuning products.



**"IN STOCK FORM, THE TRUCK HAD 2.5 PSI OF VACUUM, BUT WITH THE PUMP IN PLACE, WE HAD 8 PSI OF POSITIVE PRESSURE: HOW'S THAT FOR BIG GAINS?"**

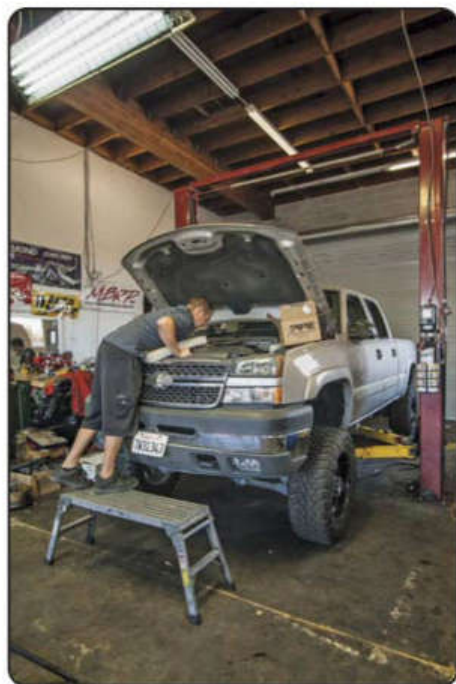


A quick call to the Duramax gurus at PPE unearthed some simple and affordable fueling mods that were aimed at not only increasing fuel pressure, but also maintaining it under long, heavy-throttle pulls where the stock system simply runs out of fuel. With the powerful but effective fueling mods in hand, we paid a visit to the diesel specialists at Left Coast Diesel in Livermore, California, where master tech Ethan Barker not only installed the trio of PPE mods, but he went so far as to explain in-depth how each part worked so we'd have a solid understanding of how and why each part helped the engine gain power.

Here's how we fixed our starving Duramax in three easy mods.

## PPE RACE FUEL VALVE

Common-rail diesels like the Duramax have sky-high fuel pressures north of 20,000psi, and under a heavy load, the factory fuel pressure relief valves are notorious for opening and bleeding



**1** Master tech Ethan Barker of Left Coast Diesel helped us install the trio of affordable Duramax fueling modifications. These upgrades made huge improvements in acceleration on our test truck, especially out of hole.



**2** Here's the PPE Race Fuel Valve. This affordable upgrade ditches the OEM fuel-pressure relief valve for a solid unit that keeps 100 percent of the fuel in the rail rather than bleeding back off into the tank.

off extra fuel-rail pressure back into the system, costing serious power and often times putting the truck into "limp mode." If that's not bad enough, once the OEM fuel-pressure relief valves give way, the more often they'll bleed off pressure until check-engine lights for insufficient fuel pressure become the norm.

But PPE was smart enough to create the fix in the form of the Race Fuel Valve, a simple device made from heat-treated stainless steel that replaces the stock or shimmed pressure relief valve with a solid unit. The PPE unit maintains fuel-rail pressure during prolonged wide-open throttle (WOT) or heavy load situations by directing 100 percent of the fuel to the fuel rail rather than bleeding it back into the system.

## PPE PORTED FUEL RAIL FITTINGS

Would you believe that the Duramax motor is fed fuel through a pair of pinhole-sized feed fittings? That's right, the GM engi-

### Performance Figures as measured with RaceLogic VBOX Sport:

#### Stock fuel system

0-30: 3.67 Seconds  
0-60: 8.36 Seconds  
50-80: 7.17 Seconds  
Eighth-mile: 10.64 Seconds @ 71.5 mph  
Quarter-mile: 16.19 Seconds @ 87.1 mph

#### PPE Upgrades

2.94 Seconds  
7.58 Seconds  
7.06 Seconds  
10.16 Seconds @ 71.6 mph  
15.75 Seconds @ 87.2 mph



**3** Here's the solid stainless steel PPE upgrade unit on the left compared to the stock unit. The stock part is known to bleed off fuel pressure, causing check engine lights and diminished performance under WOT.



**4** Barker had to dive into the Duramax with both hands and feet to access the fuel pressure relief valve since it's located on top of the motor. The valve sits just above the bell housing.



neers deemed the kiddy-sized fuel feed fittings necessary for flowing fuel to the rail, and in stock form, they're right, but the minute enthusiasts start pumping more power into their motors, their Duramax's start running low on fuel due to insufficient flow.

Again, PPE stepped in with an affordable fix; Ported Fuel Rail Fittings that feature noticeably oversized fuel feed holes so that proper fuel rail pressure during heavy engine loads can be maintained. These stainless steel fittings increase available fuel flow volume from the CP3 to the fuel rail, not only sparing the CP3 from undue wear but also providing enough fuel for clean, efficient power by relieving rail restrictions on all 2004.5-2010 Duramax LLY/LBZ/LMM motors.

### PPE DIESEL FUEL LIFT PUMP

When Ethan Barker from Left Coast Diesel hooked up a vacuum gauge to our Duramax to read fuel pressure vacuum at idle on our Duramax test truck before and after the PPE Lift Pump, we were simply amazed. In stock form, the truck had 2.5-psi of vacuum, but with the pump in place, we had a whopping 8psi of positive pressure: How's that for big gains?

Why did we have so much vacuum with the factory setup? Because... rather than depending on the OEM CP3 to pull all the way from the stock tank, the PPE Diesel Fuel Lift Pump

pushes fuel through the lines and the filter not only to maintain proper fuel pressure in the lines to prevent fuel starvation under heavy throttle loads, but to eliminate the possibility of air being drawn into the system and reducing stress on the CP3. Insufficient fuel pressure and fuel starvation causes drops in power and excessive smoke, but this ultra-compact powerhouse of a pump from PPE flows up to 160 gallons per hour (GPH) and is compatible with biodiesel and ultra-low sulfur diesel, as well as other compatible fuels. The units are made from high-quality billet aluminum with half-inch NPT inlet and outlet lines for maximum flow. They're also compact, so mounting them between the frame rails or in tight locations is a cinch. The pump motors are nearly silent, so gone are the days of loud whining. **DW**



**7** Unlike the OEM fuel rail fittings that feature pinhole-sized fuel feed holes, the PPE ported units are visibly larger to feed a pumped-up Duramax all the fuel it needs. Plus, they're cheap.



**8** We told you the PPE Ported Fuel Rail Fitting had a visibly larger fuel feed hole: Look at the tiny stock fuel rail fitting on the left compared to the PPE unit on the right.



**5** With some finagling we got a shot of the elusive unicorn of a bolt. Be careful when removing the bolt, as they have a knack for seizing up and stripping out, which means the quick-and-easy job instantly becomes hours of labor since the fuel rail will then need to be removed.



**6** Here's a shot of the PPE Race Fuel Valve installed and ready to go.



**9** There are two sides to the fuel rail on a Duramax, so two of the ported fuel rail fittings are needed. We began on the passenger's side by moving the A/C compressor out of the way to gain access underneath.



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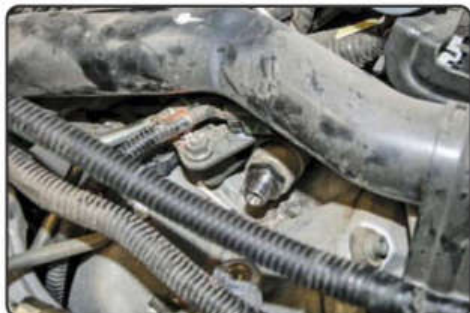


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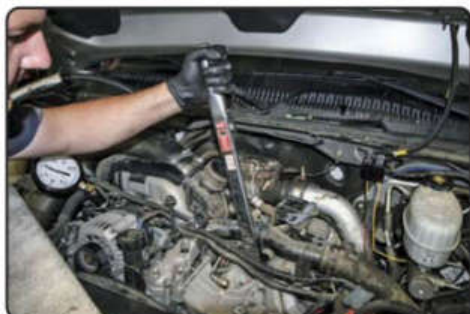




**10** Buried underneath some wires and tubes is the passenger's side fuel line fitting. Simply remove the OEM one and install the PPE unit.



**11** Be careful when performing the install, as you don't want to strip the factory fuel rail; it's a pain to remove.



**12** Remember, it's important to torque everything to the recommended settings.



**13** The driver's side fuel rail fitting is located underneath plenty of components, so be patient when gaining access to it. Remove and replace the unit just as we showed for the other side.



**14** Here's the PPE Lift Pump. The compact design fits in tight spaces and features a billet aluminum base with a quality, serviceable motor that flows up to 160 gallons per hour (GPH).



**15** The PPE Dual Relay kit allows users to setup their lift pump, so it only runs when the engine is running, not when the key is on. This comes in handy when sitting in the truck listening to the radio with the engine not running.



**16** The PPE high-flow install kit came in handy and made the installation process a bolt-on affair.



**17** With the stock components in place, our Duramax test truck idled with a fuel pressure of 2.5psi of vacuum, but that all changed with the addition of the lift pump. This is because the lift pump feeds the CP3 rather than the CP3 having to draw fuel.



**18** Barker decided to mount the compact pump inside the frame rail where it would be easily accessible and protected from the environment during heavy off roading.









**19** Measure twice, cut once: Be careful when cutting the fuel lines so as not to remove too much or to collapse the factory hard lines.



**20** It's also a good idea to mount the pump where the motor access panel is easily reached should you someday need to rebuild the motor.



**21** Proper sealant is important when working with NPT lines, but make sure that whatever you use doesn't get into the fuel stream.



**22** The Lift Pump comes with all the proper electrical components, and we decided to utilize the dual relay kit for added insurance. Don't forget to solder in the small diodes; all the electrical components matter.



**23** Here, Barker tapped into the factory fuse panel for some key-on power.



**24** Note the tidy wiring installed with loom and electrical tape. The more initial time you spend on the wiring, the better, since having to undo and redo messy wiring is a bear.



**25** Here's the PPE Lift Pump installed and ready for flow. The quiet motor coupled with the rubber mounts makes for a near-silent experience. Seriously, unless you're listening for it, you'd have no idea it was there.



**26** With the lift pump and fueling upgrades in place, our fuel pressure at idle went from 2.5 psi of vacuum to a positive 10 psi. How's that for a measurable upgrade? **DW**

### SOURCES

#### LEFT COAST DIESEL

925.784.9763  
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#### PACIFIC PERFORMANCE ENGINEERING (PPE)

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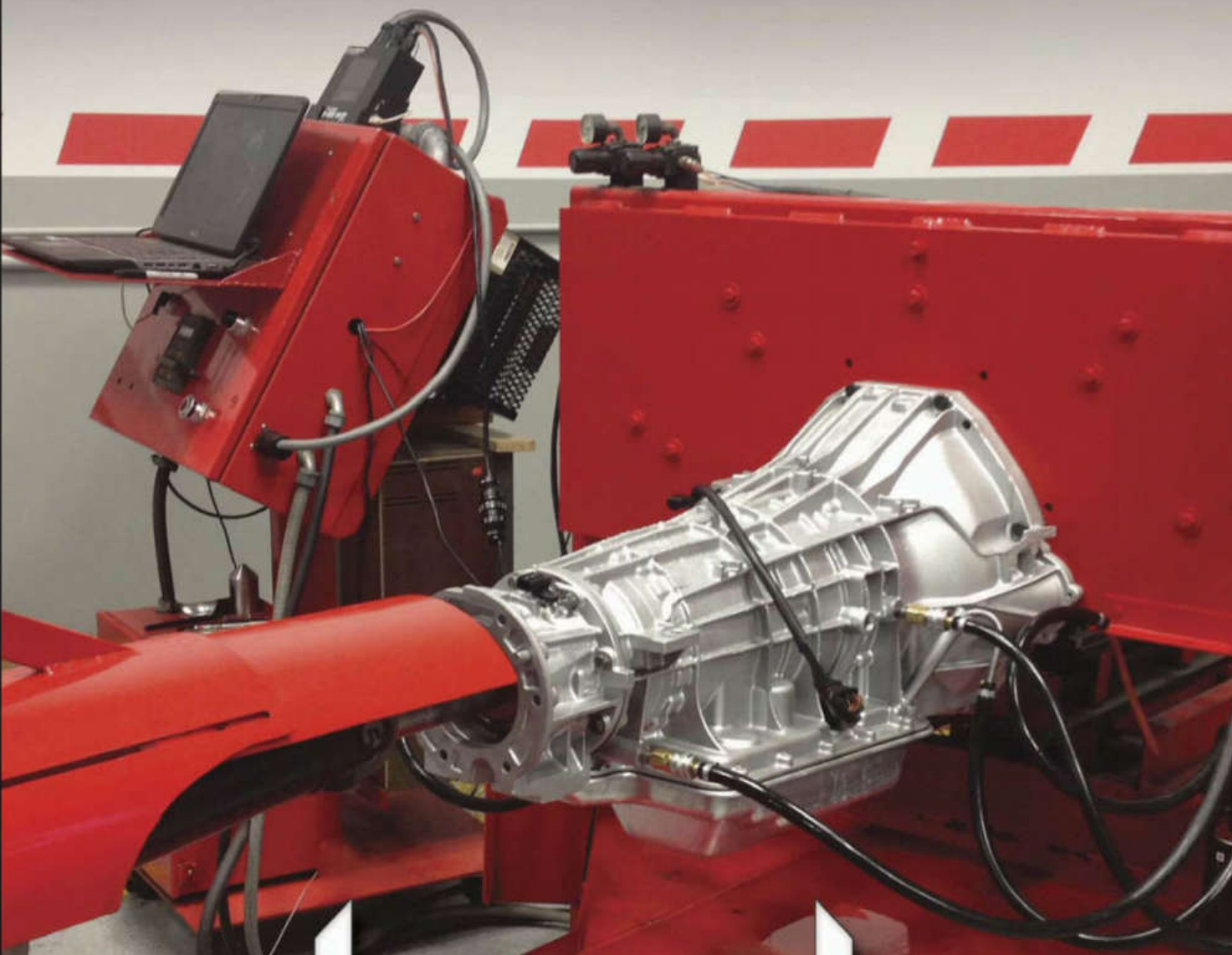
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# ALL NIGHT

## Small-Town Sled Pull Gets Wild

TEXT AND PHOTOS BY MIKE MCGLOTHLIN

**W**hat's more American than spending the 4th of July holiday taking in a sled pull? While thousands of small towns across the United States celebrate Independence Day in spirited revelry, the village of Oquawka, Illinois, takes the tradition one step further. The town, in conjunction with the local businesses and the West Central High School FFA, hosts a massive truck and tractor pull each summer. An added bonus comes in the form of free admission, great food and a jovial atmosphere.

This year, 31 classes took to the dirt. Among them were 23 groups of tractors and six pickup truck classes, with even a class for semi trucks. To plow through this many classes, the event blasted off early evening, and two sleds ran non-stop deep into the night. This year, the clock struck 1 a.m. before the last tractor rolled to a stop. If you find yourself in the greater Western Illinois area next July, this jam-packed sled pull is one event that won't have you missing fireworks. **DW**

The 8,500-pound Open Street Diesel class was a great way to bring in big horsepower trucks, and the fact that it paid out \$1,000 to the winner didn't hurt either. This class allowed hanging weights, multiple turbochargers and nitrous oxide but made having an OE driveline and a valid license plate a mandatory rule.





# AMERICA

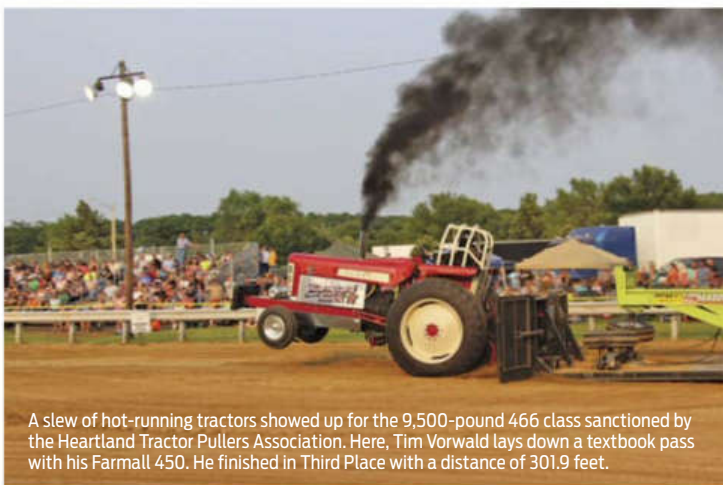




There's nothing quite like a P-pumped 24-valve Cummins, and this 1999 Dodge gave it a go in the Open Street Diesel class. The owner told us the truck sports a 62mm over S474 turbo arrangement and that the factory 12mm pump had been "maxed out."



Clawing its way to a 328-foot second place finish in Open Street was Eric Loy's 2005 Dodge Ram 3500. It would also pull in the Work Stock Class later in the night, where it claimed first place.



A slew of hot-running tractors showed up for the 9,500-pound 466 class sanctioned by the Heartland Tractor Pullers Association. Here, Tim Vorwald lays down a textbook pass with his Farmall 450. He finished in Third Place with a distance of 301.9 feet.



With 31 classes, (spread throughout three sanctioning bodies) two sleds running nonstop, and more than 200 hooks, there was never any shortage of action at the annual 4th of July truck and tractor pull in Oquawka, Illinois. As of press time, we didn't have the final spectator tally, but we do know the FFA concession tent sold more than 2,200 sandwiches, along with over 100 cases of bottled water.



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Storming its way to Fourth Place in the Open Street Diesel Truck Class was Kyle Kropp's nasty Duramax. His Silverado would carry him just over 319 feet. In the Work Stock Class, he would end up third, hauling the iron Bungart sled a total of 341 feet.



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Despite not being able to get on top of the chargers until mid-track, Brian Randall's 2006 Dodge still managed to yank the sled 323 feet—good enough for Third Place in Open Street. His triple turbo'd Ram lays down more than 1,100 hp on the chassis dyno and has run a 10.69-second quarter-mile.



Kaden Nelson's compound turbo'd, 650-hp 2009 GMC made a good pass in the Open Street Class. Unfortunately, he hooked just as the evening moisture was beginning to rise to the track's surface. The result of the added bite cost him his rear driveshaft—still, a small price to pay in the sled pulling game.



When we spotted this old single axle Autocar dump truck parked in the semi section, we were hoping we'd get to see it hooked to the sled. Unfortunately, it was just for show.



This Detroit powered, GMC Diesel 650 is one of the cleanest versions of GM's early 1950's big rigs we've ever seen. It's definitely a piece of Americana worth holding onto.

Taking the win in dramatic fashion in Open Street was Jeff Krause and his 2006 Chevy. Sporting a 72mm VGT and an S484 atmospheric charger combination, 250 percent over injectors, and dual CP3s, the 950-hp Duramax set the mark to beat early in the class.





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# ALL NIGHT AMERICA



Drew DeClerk's 12-valve powered standard cab Dodge Ram 2500 was a force to be reckoned with in the Work Stock Class. He would end up Fourth (out of 20 trucks) with a 339-foot effort.



Created by the United Pullers of America organization, the fuel-only 8,500-pound Work Stock Diesel 4x4 Truck Class was designed for daily driven, full-bodied pickup trucks. Class rules prohibit hanging weight, require an OEM drive-line and allow a direct bolt-on single turbo to be run. Cummins mills are allowed to utilize a T4 flanged, S300-based turbocharger with up to a 2.6-inch inducer.



Don Newton's IH666 was one of many red machines taking home wins this year. His 341-foot hook gave him the win in the East Central Iowa Pullers Association's (ECIPA) 6,700-pound Light Limited Super Stock Class.

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Aaron Cully has been at it for years in his LLY Duramax. He's a regular in the UPA Work Stock Diesel Truck Class, where there is no shortage of Duramax competition.



Another strong running 12-valve candidate in the Work Stock Class was Morgan Primm's Dodge Ram 3500. This truck takes advantage of class rules, which allow Cummins powered vehicles to use a T4 flanged, S300-based turbocharger. Unfortunately, some clutch gremlins shut Morgan down a tad early in his run.

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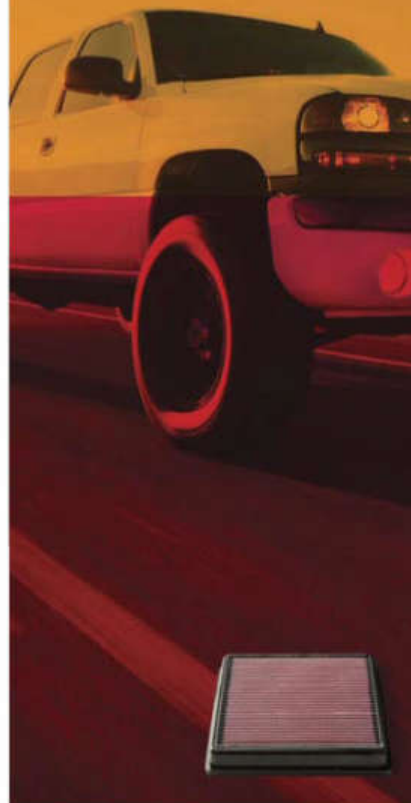
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# Inside Water Methanol Injection

## More Power, Less EGT, and Greater Reliability

TEXT AND PHOTOS BY JASON SANDS

**P**erhaps some of the most underrated performance parts in the industry are water-methanol injection systems. On street trucks, a well-tuned water-meth system can be worth 75 horsepower or more, as well as a drop in exhaust gas temperatures of 100 to 300 degrees. In competition applications, huge engine-driven water injection systems can reduce exhaust gas temperatures by up to 1,000 degrees and also allow for more aggressive tunes. So—it's safer—with more power? That is correct.

### HOW WATER INJECTION WORKS

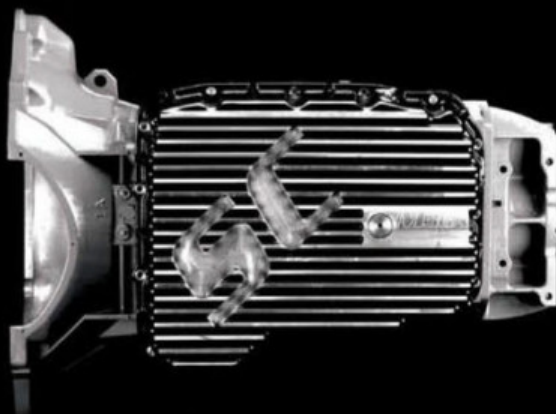
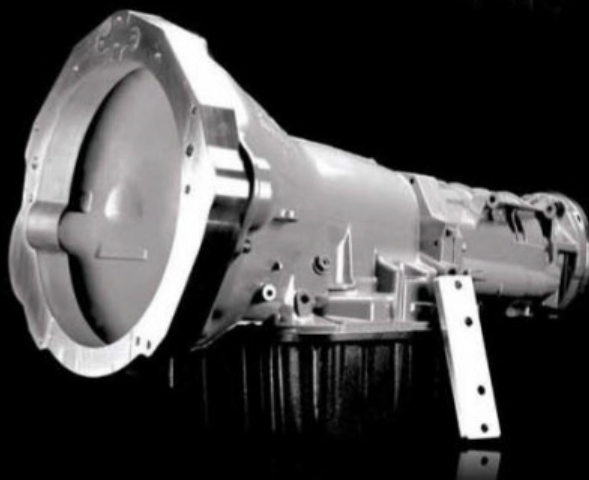
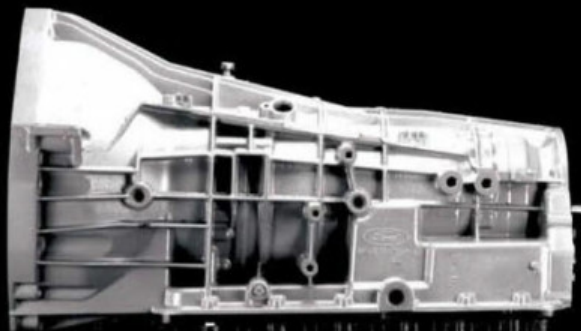
As an engine makes more power, it also makes more heat. Eventually, combustion temperatures and exhaust gas temperatures, EGT, can reach dangerous levels, and that's where water injection comes in. Even with efficient intercooling, diesel engines found in high-horsepower street applications or racing

vehicles will still need additional cooling. When water is injected into the engine, it is converted to steam, and when this happens, it absorbs an enormous amount of heat out of the air. This function is called the latent heat of vaporization, and reduces both combustion and exhaust gas temperatures without having much of an effect on power.





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### ADDING METHANOL TO CREATE WATER-METHANOL INJECTION

At some point, an innovative gearhead figured out that you could make some extra power with water injection just by mixing it with methanol. Not only does methanol have a latent heat of vaporization value all of its own, it also is a fuel, so it makes power when it is injected into an engine. Since diesel engines are

compression-ignition engines, introducing a fuel into the intake may seem dangerous; but that's the beauty of the water-methanol mix. If 100-percent methanol was injected into a diesel, either a dangerous backfire, or engine-damaging pre-ignition (which normally isn't possible in a diesel) would occur, resulting in some fried parts. The water component in water-methanol injection acts like a detonation inhibitor, and keeps the methanol



**1** This Banks Straightshot water-methanol injection kit is a good example of a modern state-of-the-art system. It comes with a tank, lines, wiring, controller, solenoid, pump, EGT probe, nozzles, and all the fittings necessary for installation.

### Competition Kits

High horsepower applications have their own unique set of problems when it comes to cooling. When it comes to trying to keep exhaust gases under control on a 2,000 to 3,000 horsepower diesel, a lot of water has to be injected into the engine, well past what most street kits are capable of delivering. While pickup truck systems may inject water at 200 to 300psi, it's not uncommon for competition water systems to run at 800 to 1,000psi, with up to 12 delivery nozzles. If a water system fails in this type of application, EGTs can rocket past 2,000 degrees in a matter of seconds, so water injection is an integral part of keeping these engines alive.





# FlowMAX



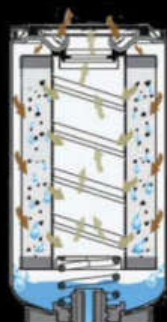
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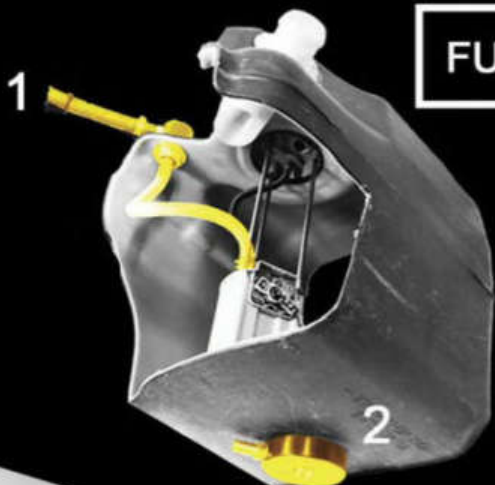


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**"ON STREET TRUCKS, A WATER-METH SYSTEM CAN BE WORTH 75 HORSEPOWER OR MORE, AS WELL AS A DROP IN EXHAUST GAS TEMPERATURES OF 100 TO 300 DEGREES"**

from auto-igniting under the high compression temperatures of a diesel. While it seems that a 50/50 mix is a good safe ratio for cooling and power, we have heard of folks going as high as 70 percent methanol, which sometimes works (lots of power) and sometimes doesn't (engine damage).

### STREET-ORIENTED WATER-METHANOL INJECTION KITS

Adding fuel is the easiest way to extract more power out of a street-driven diesel, and even with just basic tuning, exhaust gas temperatures can reach the point where they are at dangerous levels. A stock Duramax engine for instance, will only generate about 1,300 degrees of exhaust gas temperature (which is safe) but we've seen tuned engines that have peaked at 1,800 degrees or even higher. With this type of heat, it's only a matter of time before damage occurs.

While increasing turbocharger size or intercooler efficiency is a good way of keeping exhaust gas temperatures under control while adding power, we've also seen good results with water-methanol injection. With a 50/50 mix, average gains in power are usually between 35 hp and 75 hp, with a 150 to 300-degree drop in EGT. Having these systems triggered at part throttle on aggressive tunes can also result in greater towing speeds, as more throttle can be applied, while keeping EGTs in or below the 1,200 to 1,300 degree "safe" zone for diesels.

### CONTROLS

Injecting a bunch of water or a water-methanol mix at low boost or rpm can result in "snuffing" the engine out. Essentially, there's too much water compared to fuel and air, so the engine stops running. With this in mind, builders have integrated different forms of control into water-methanol systems to ramp up the level of injection as boost and rpm rises. The simplest form of activation is a pressure switch, like a Hobbes switch, which will



**3** If you're just looking for an extra burst of power and don't need much capacity, a stock windshield washer reservoir can be used as a water-methanol tank. The red fluid inside is Boost Juice, a 50/50 pre-mix from Snow Performance.



**2** A small arming switch can be used to activate a water-methanol system manually, and can often be placed in an unassuming spot, like the bottom of a dash.



**4** When towing, using at least a 5-gallon tank is a good idea, as the last thing you'll want is to run out of cooling on a long grade.



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### "IN COMPETITION APPLICATIONS, WATER INJECTION SYSTEMS CAN REDUCE EXHAUST GAS TEMPERATURES BY UP TO 1,000 DEGREES"

trigger the system at a certain pre-set amount of boost. Up from there are throttle-position triggers, digital controllers, and boost and EGT-based systems.



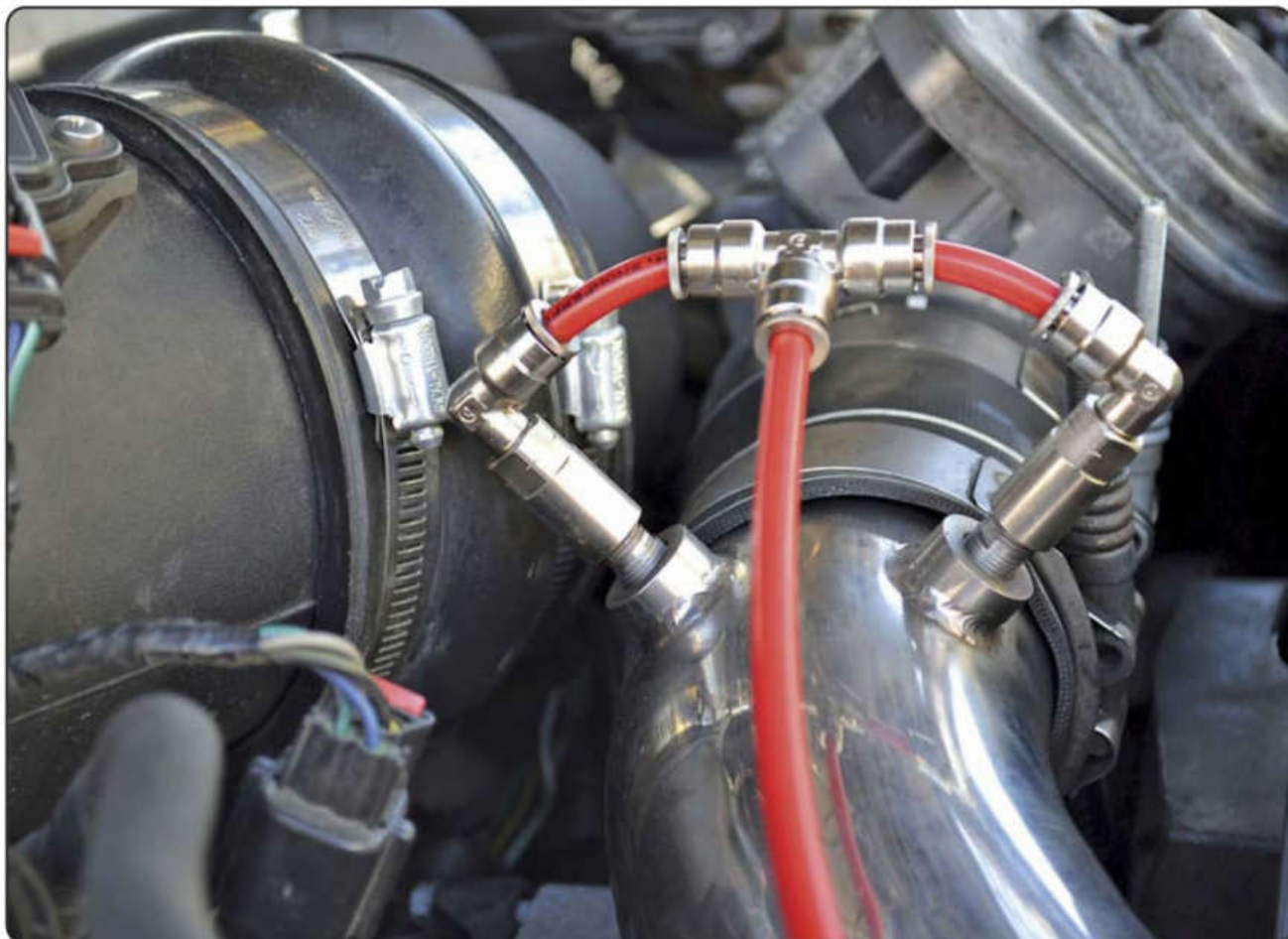
**5** One of the main components to a water-methanol system is the high-pressure pump, which creates about 200 to 300psi on street-style kits. It should be mounted below the tank and as close to it as possible.

#### OPTIONS

Injection systems vary in flow, controls, and options, and you're probably not going to need a sophisticated multi-stage system just to cool down an old IDI for towing use. By the same token, a street-based kit probably won't be enough for a 1,500 horsepower sled puller, so matching the kit to the application is an important part of selecting a system.

#### IS WATER/METHANOL INJECTION RIGHT FOR ME?

There are plenty of diesels in the 300 to 500 rear-wheel horsepower range, and water-methanol injection will work quite well on just about every one of those trucks. In competition applications, we're surprised more folks outside of sled pulling (like fast-street and drag trucks) don't run water or water-methanol systems, as replacing pistons, turbines, and other hard parts get expensive. If you're looking for a little extra power or cooling, a water-methanol injection system might be just what the doctor ordered for your diesel. **DW**



**6** Nozzles are usually mounted in the intake post-turbo, and can even be disguised fairly well. Most hot street performance systems use two large nozzles, such as these two 625 ml/min units from Snow Performance.



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**7** The ultra-high pressure water or water-methanol is injected into the intake stream of a diesel engine as a mist, which is then swirled into the engine for cooling and combustion.



**9** Simple boost-based systems can be especially effective on older trucks. On an early VE-pumped Dodge, we saw a 35-hp gain at peak power, but past 3,000 rpm the truck picked up nearly 70 horsepower, as the methanol in the system carried the power band out further as the diesel fuel pump defueled.



**10** Nitrous can be particularly hard on a diesel engine. The immense heat it creates can be calmed down by water injection, and turbine damage can be avoided with a healthy dose of water in addition to the nitrous.



**8** Very sophisticated controllers are available for use with modern water-injection systems. This control interface from Banks is a simple 2 1/16 gauge unit that can be used to command two stages of injection. It also displays boost, EGT, throttle position, flow and can be adapted to factory MAP sensors.



**11** An interesting mid-step between all-out competition kits and street-based systems is this large electric kit from Scheid Diesel. The simple boost-based setup can be adjusted to trigger at 40 to 60psi, and provides 600psi of pressure. It's recommended for trucks in the 1,000 to 1,500 flywheel horsepower range.





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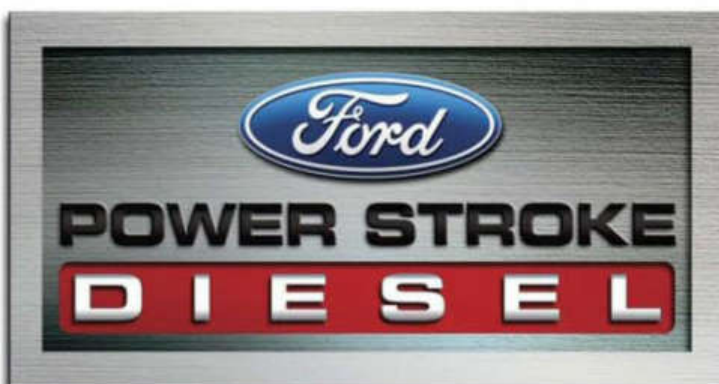
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**12** Diesel World Editor-in-Chief Adam Blattenberg has been testing the Snow Performance Stage 2 kit for years on his 7.3L, and has seen nearly 50rwhp on the dyno and a good 2 to 3mpg boost in average fuel economy, thanks to the water-methanol mixture being ramped in at very low throttle positions (like highway cruising). While towing roughly 10,000 pounds in a modest tune, EGTs have never gone above 1,000 degrees while climbing large grades at 65 MPH.



**13** Another example of a well-tuned water-methanol system is the twin-nozzle kit on Jerry Allen's '05 Chevy. On the dyno at Brown's Diesel, a hand-mixed water-methanol mixture of "a little more than 50 percent" was worth nearly 60 rear-wheel horsepower.



**14** Three nozzles from Snow Performance seen here in the cold side intercooler tube. **DW**

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# Tuned Titans

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BY JACOB WHITE

**W**hen you think of Chicago, Illinois, a few things come to mind, such as Michael Jordan and his 6-time NBA championship winning Bulls, the 106-year drought (since the Cubs have won the MLB World Series) and the 1,451-ft tall Willis Tower nestled in downtown, which is the second tallest building in the country. But what Illinois has that goes unseen to many is a strong agricultural economy due to some of the country's best growing soil and vast farming communities. With farming, come hardworking men and women who rely on mechanical expertise to stay busy during the winter months. With that knowledge and time, you can rest assured that some pretty impressive diesel performance builds and sled-pulling trucks can be found within Illinois.



# Tuned Titans

UNLIKE SOME DYNO COMPETITIONS, THE DAY WASN'T SO MUCH ABOUT WHO WAS BETTER THAN WHO, BUT MORE ABOUT OWNERS GETTING A CHANCE TO SEE WHAT THEIR HARD-EARNED CASH AND COUNTLESS HOURS IN THE SHOP TINKERING ON THEIR TRUCKS HAD ACCOMPLISHED.



The CPS chassis dyno room is used almost daily for testing new products and creating new tuning for customers all over the country, but for one weekend a year, the doors are opened to the public, and the bleachers are setup to help prove where bragging rights for the highest horsepower truck belong.



While some mid-morning rain showers and overcast skies rolled over Marengo, IL, during the event, it didn't keep the spectators and competitors off the dyno. The crew from Calibrated Power put together a great event with plenty of their products and shop projects out on display.

Calibrated Power Solutions may not be a name you're familiar with, but if you follow the performance Duramax or Cummins scene you're sure to have heard of DuramaxTuner and CumminsTuner, some of the most popular and successful EFI Live custom tuning companies in the business. Calibrated Power Solutions (CPS) is the official name of the business, as the names CumminsTuner and DuramaxTuner may limit the public perception to

what they actually do. CPS specializes in performance tuning for many applications including: GM Vortec gas, Jeep CRD Diesel, Chevrolet Cruze Diesel, Volkswagen Jetta Diesel, and most recently have expanded into the agricultural market with tuning for the John Deere platforms. While these are relatively small markets, the 2006+ Cummins and 2001+ Duramax trucks are obviously where the bulk of CPS' business comes from. They've helped tune and

build some of the strongest running trucks in the country. On May 16th, owner Nick Priegnitz and his crew put together a customer appreciation day and dyno event at their headquarters in Marengo, Illinois.

Unlike some dyno competitions, the day wasn't so much about who was better than who, but more about owners getting a chance to see what all their hard-earned cash and countless hours in the shop behind the house tinkering on their trucks



Kyle Novak of Machesney Park, IL, strapped his 2001 GMC Sierra down to the dyno to see where his hard work and bundle of aftermarket parts helped him get to; with 623 hp to the ground, it's safe to say wherever he's headed to next, he'll get there quick.



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The 1958 Chevrolet Apache truck, dubbed "Apache Max" is the latest Duramax-powered truck to hit the DuramaxTuner fleet of competition vehicles and will soon be seen in the local sled pull Work Stock classes. This vintage Chevy has been outfitted with a fully built LB7 engine, all new DT Stealth turbocharger, custom air to water inter-cooler, plenty of injector and a ZF-6 manual transmission. The truck has been a 2-year work in progress with a complete frame-off restoration job with all new paint, upgraded axles and drivetrain.

had accomplished. There were no classes made for Stock, Single and Compound trucks, as the event was just a way of saying thanks to customers and friends while giving everyone an excuse to talk trucks for the day. Calibrated employees were talking to spectators about different products and options to help improve their trucks, from basic Spade tuners to drop-in replacement Stealth turbochargers out on display.

Taking home the highest horsepower numbers for the day was Jim Rendent's 2006 5.9L Cummins sporting a massive set of compound turbos, dual CP3s and



No, it wasn't the best looking rig at the event, but this diesel-powered 1981 Volkswagen Rabbit owned by Mitch Wherli was proud to take home the low number on the day with a not-so-earth-shattering 32 hp and 121lb-ft of torque.



No, your eyes aren't playing tricks on you; that indeed is an emission legal LML Duramax with an S475 compound turbo kit. As the DuramaxTuner LML test bed, this 2011 2500HD Denali produces 640 hp to the rear tires while maintaining a fully functional EGR, DPF and Urea system.

Jim Rendent's 2006 5.9L Dodge isn't just built for show and definitely had what it needed to snag overall high horsepower numbers for the day. With a pair of big polished turbos and plenty of fuel, the Common Rail 5.9L was more than 300 hp above second place; this nasty little hot rod came in at 1,173 hp and over 2000lb-ft of torque.







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It takes a keen eye, but looking closely, you can see not two but three S400 turbochargers hanging off the side of that Duramax engine. Owned and built by Jason Werhli of Werhli Fabrication, this LB7 Duramax has a host of custom parts that have helped push it to be one of the highest horsepower trucks to ever cross the DuramaxTuner chassis dyno.



Over the course of the past year or two, Calibrated Power Solutions has branched out into the agricultural market with their new John Deere tuning calibrations that can offer better PTO horsepower, better pulling power, and even moderate fuel savings. Their most recent purchase is this unique mobile PTO dyno that can be taken out into the field or to agricultural expos for on-site tuning.



Just a month before the CPS Dyno Day event, the DuramaxTuner crew had this LB7-powered drag truck outfitted with its Corvette-killing attire and tried its hand at The Texas Mile. Running over 172 mph, you're looking at the fastest diesel-powered truck to ever hit the Texas Mile track.

just about every supporting mod you could think of. As the current record holder on the CPS dyno, Rendent was hoping to beat his previous numbers this go around, setting the record even higher, and at 1,173hp and 2015ft-lbs of torque, he did just that. Second place was another Cummins powered truck at 828 hp and 1341ft-lbs torque, owned by Justin Lilley of Princeton, IL. The bright green Dodge proved it wasn't just built for show. The third place numbers were put down by Chuck Dille's 2007 GMX Duramax with 817 hp and 1513ft-lbs. **DW**

#### SOURCE

**CALIBRATED POWER SOLUTIONS**

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CalibratedPower.com



It wasn't an official "Show-n-Shine" contest, but there were plenty of trucks on hand proudly showing off what was under the hood. The custom twin and triple turbo kits by Werhli Fabrication and monster 1000+hp LML Dually build by Empire Diesel were a few of the crowd favorites.

#### RESULTS:

| NAME               | TRUCK            | HP   | TQ   |
|--------------------|------------------|------|------|
| Jim Rendent        | 2006 Dodge 5.9L  | 1173 | 2015 |
| Justin Lilley      | 2004 Dodge 5.9L  | 828  | 1341 |
| Chuck Dille        | 2007 GMC LBZ     | 817  | 1513 |
| Andrew Broan       | 2005 Dodge 5.9L  | 811  | 1583 |
| Mark Downing       | 2006 Chevy LBZ   | 765  | 1553 |
| Theo Peterson      | 2001 Chevy LB7   | 709  | 1266 |
| Ryan Ellis         | 2013 Chevy LML   | 666  | 1303 |
| Richard Gresty     | 2006 Dodge 5.9L  | 634  | 1405 |
| Kyle Novak         | 2001 GMC LB7     | 623  | 1116 |
| Ryan Yeager        | 2012 Dodge 6.7L  | 591  | 1190 |
| Thomas Bainbridge  | 2005 Dodge 5.9L  | 581  | 1091 |
| David Robinson     | 1999 Dodge 24V   | 564  | 1145 |
| Robert Rogers      | 2011 GMC LML     | 546  | 1088 |
| Jeff Johnnsen      | 2015 Chevy LML   | 537  | 1072 |
| Todd Johannsen     | 2014 Chevy LML   | 534  | 1067 |
| Ty Bigos           | 2007.5 Chevy LMM | 531  | 1127 |
| Tyer Westphall     | 2001 Chevy LB7   | 521  | 1063 |
| Adam Hartje        | 2006 Dodge 5.9L  | 516  | 1005 |
| Brandon DiGiovanni | 2008 Dodge 6.7L  | 510  | 964  |
| Mike Bates         | 2007 Chevy LBZ   | 507  | 1141 |
| Wyatt Peterson     | 2001 Chevy LB7   | 499  | 1088 |
| Mike Bates         | 2004 Chevy LB7   | 482  | 1132 |
| Brad Baser         | 2006 Chevy LBZ   | 466  | 871  |
| Mike Milewski      | 2009 Chevy LMM   | 461  | 997  |
| Cody Mullikin      | 2008 GMC LMM     | 451  | 945  |
| Adam Degaetano     | 2000 Dodge 24V   | 423  | 1050 |
| Glen Larson        | 2009 Chevy LMM   | 415  | 893  |
| Gus Wall           | 2006 Chevy LBZ   | 398  | 794  |
| Alex Swanson       | 2005 Chevy LLY   | 369  | 771  |
| Brick Larssen      | 2013 Dodge 6.7L  | 362  | 1016 |
| Tanner Fredericks  | 1996 Dodge 12V   | 306  | 875  |
| Mitch Werhli       | 1981 VW Rabbit   | 32   | 121  |



When you have CumminsTuner and DuramaxTuner in the name of the event, the Ford turnout may be slim. Case in point: This big F-350 was the only Ford to attend the dyno day event. Interestingly enough, the Power Stroke was still absent, as this "High Boy" had undergone a heart transplant: It's Cummins powered.



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# DIESEL SWAPS!

Everything You'll Need to Pull Off a Diesel Conversion, Plus a Little More.

BY DW STAFF

PHOTOGRAPHY BY DIESEL WORLD STAFF  
AND COURTESY OF THE MANUFACTURERS

**T**he questions we usually have when going to swap a diesel into something that didn't originally come with one generally start off with matching an engine's power output to a project's needs. That's one of the most fun parts as it's usually accompanied with a bit of bench racing and dreams of how the project will perform in the end (be it a boat, hot rod, pickup or bar stool racer). After that, question's trend towards "Will it fit?" or "Is it possible to pull off?" Sheet-metal can almost always be trimmed, massaged or removed all together to create clearance when needed. It's obstacles like electronics or adapting an engine to an existing transmission that usually are the most common things holding a project back.

Luckily, thanks to the automotive aftermarket, there's help as conversion parts do exist. Tons of them! We've put together a small list of diesel conversion specific products as well as a massive list of vendors who can help you swap a diesel into your ride. We've also gone back through the archives and picked our favorite, top 10 diesel converted rigs from the past few years. Hopefully, this will give you a bit of motivation and help to get that project rolling into the diesel world.

## Black Beauty

This Duramax Powered street/strip truck is owned by Brett Deutsch. His grandfather gifted this 1969 Chevy C10 for his 15th birthday. Brett's grandfather had swapped in a three-cylinder Detroit Diesel engine, but the power was underwhelming. To satisfy his need for power, a swap to a small block Chevy gasser was installed but proved to be lacking too. Today, this truck is a Duramax diesel powered daily driver that can burn down the strip in the mid to low 9-second slot.

For the full story, see Diesel World's January 2014 issue, or go to [DieselWorld.com](http://DieselWorld.com)



## Diesel Muscle Car

Rick Fletes loves power and is a real car enthusiast. He loves Detroit Iron and going fast on the track. Being a practical type, Rick knew that for less money than it would cost for a full blown Big Block Chevy gas motor, he could swap in a Duramax diesel. The diesel surely would offer more torque and be more reliable than a full race big block gas race engine ever would be.

Rick located a wrecked GM truck with a low mile LB7 and scavenged the harness and engine for his race ready, diesel powered, daily driver. With the Duramax backed by a Turbo 400 automatic and Gear Vendors Overdrive, this oil burning Chevelle turns in top track speeds around 150 mph, with ET times in the mid '11s. During the week, this daily driver gets between 25-30 mpg.

For the full story, see Diesel World's December 2012 issue, or go to [DieselWorld.com](http://DieselWorld.com)





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## Cummins Powered Classic Power Wagon

Strength, reliability and simplicity—that's the way pickups used to be made. Trucks were made for work, not comfort. Vintage pickups are enjoying a resurgence in popularity, and Brian Wellman of Crandall, Indiana, is the enthusiastic owner of a very unique, classic Dodge.

While it was acquired in the rough, this W200 Dodge Crew Cab was restored to a near-new condition. The major upgrade was the swap to a 1993 12-valve Cummins. The diesel is mated to a '92 A518 over-drive automatic and a divorced mount 205 T-case splits the power to both axles on this 4x4.

**For the full story, see Diesel World's January 2014 issue, or go to [DieselWorld.com](http://DieselWorld.com)**



## 1948 FORD F3 PICKUP

The 1948 Fat Fender F3 Ford pickup is a classic. While unique in and of itself, owner Andrew Derdok wanted something extra special for his restoration. That special touch is the 5.9L 12-valve Cummins under the hood. The diesel is backed by a Dodge 727 automatic; and 3.07 "road gears" let this truck cruise down the road at the posted highway speeds with ease.

The original plan was to make this truck a daily driver and function as a true truck to carry a dirt bike and other toys in the back. That plan changed, of course, when the finished rig was show quality.

**For the full story, see Diesel World's November 2014 issue, or go to [DieselWorld.com](http://DieselWorld.com)**



## 1967 CAMARO RACER



The owner of this red racer, Dustin Hamm from Sebastopol, California, acquired this 1967 Camaro when he was just 16 years old. It came to him with a 600-hp small-block Chevy gasser V-8. The trouble was, the power came at a cost. The cost of getting just 8 miles per gallon was seen at every single fill-up.

In 2009, Hamm decided to swap in a LBZ Duramax diesel. This was swapped into the Camaro, with a 47RH automatic from a Dodge diesel truck. The Camaro now gets 25-30 mpg around town and turns in 13.0 ETs at around 110 mph on the track.

**For the full story, see Diesel World's November 2014 or go to [DieselWorld.com](http://DieselWorld.com)**





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# DIESEL SWAPS!

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## SUPER CHIEF

David Chader was a car guy from a young age. At 11, he convinced his parents to buy the 1979 Jeep Cherokee Chief from a neighbor. During his senior year of high school, David and his dad decided to perform some "mild" modification to the Jeep. This included swapping in a Cummins 6BTA to replace the original AMC 360 gas engine. The 6BTA had recently been rebuilt, and it was treated to some upgrades before being slipped into the Jeep. A Sun-Coast 1994 47RH

automatic transmission sends power to the transfer case and then splits out to the front and rear Dana 44 axles. The Cummins allows David's mighty Cherokee Chief to average 25 mpg during extended travels all while not missing a single beat.

**For the full story, see Diesel World's December 2006 or go to DieselWorld.com**



## 1929 Model A Oil Burner

It has become an urban myth that when Henry Ford introduced the Model T, it was available in any color you wanted, as long as it was black. This isn't true, but the fact that neither the Model T nor late Model A where available with a diesel engine is. Cirius Noble is the owner of this fine 1929 Model A and it does have a diesel. A 2.1L (128 ci) I4 Renault diesel from a '89 Jeep Cherokee was

swapped into the Ford. This engine has an aluminum block and weighs only two-thirds of the original cast iron Ford gasser. It also has more than double the horsepower and gets better mileage too.

**For the full story, see Diesel World's January 2014 or go to DieselWorld.com**



## RUSTY ROSE

Rat Rods are a breed of their own. These patina'd rigs are rusty and rustic on purpose, and their owners are often as unique as their rigs. Harvey Grant is one of these unique car/rod fanatics, and his Rusty Rose is one of a kind. A 1951 Chevy truck cab, 1950 bed, 1947 grille are all blended into the body for this Rat Rod. The drive train is out of a 1993 Dodge pickup. The 12-valve Cummins 5.7L diesel has been modified with twin stock turbos and other upgrades. While not technically an engine swap, it's more of a custom build. This diesel rig is unique and shows just how wild you can get with your truck, if you let your imagination run wild too.

**For the full story, see Diesel World's October 2012 or go to DieselWorld.com**





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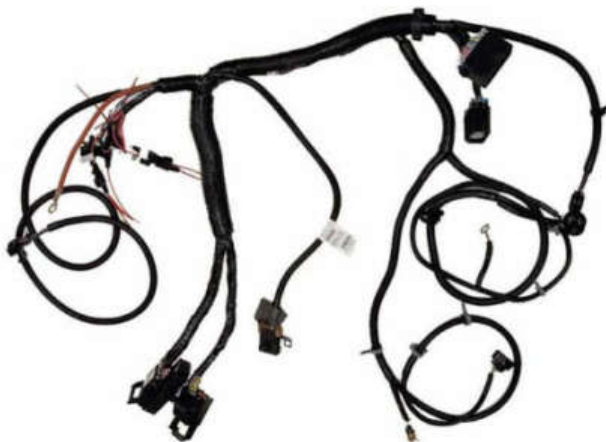
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### Duramax Stand Alone Wire Harness

PPE offers a complete stand alone wire harness for the Duramax engine from 2001-2010. When combo'd with their Hot+2 ET Race Xcelerator programmer, all that you'll need to get that Duramax running is hook up a couple grounds, find 12V constant power, turn the key on, hit that start signal, and you're good to go.

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### Ford F-150 4BT

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## GM IFS Pick-up Conversion Kit

The GM IFS truck is capable of much, but it's better with a Cummins under the hood. Diesel Conversion Specialists offer 6BT and 4BT conversion kits for these trucks. These kits include adapter plate, motor mounts, sensor adapters (to keep your OEM sensors) and an exhaust manifold. Everything is bolt-in with only light modifications required to the truck.

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## ATS 4R100 to Cummins Adaptor Kit

This kit from ATS Diesel is quickly becoming popular with the late model Cummins crowd due to the problematic 68RFE transmission. Using ATS's kit allows Cummins owners to swap in a much stronger 4R100 trans, but also helps Ford owners swap in a Cummins with their existing 4R100 backing it up.

**ATS Diesel**  
**866.209.3695**  
**ATSDiesel.com**



## NP205 Transfer Case Adaptors

These adapters will allow a Dodge diesel 4WD NV4500 5-speed manual to mount to the durable NP205 transfer case. Three adapters are available; they are perfect for doing Cummins conversion swaps into an older truck. The adapters have added a series of adapters for GM's 6-speed automatics (6L80/90E) transmissions to the NP 205 transfer case. Part numbers are 50-9550, 50-9551 and 50-9552. The 50-9551 is seen here.

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## PMF 2011-13 Ford F-250/350 Transfer Case Indexing Plate

When taking on an engine swap, the entire driveline must be taken into consideration. Often times the transfer case on a 4x4 model just won't be in the proper position for your swap to go smoothly. This can often be corrected by clocking the T-case into a different position of rotation.

This CNC-machined transfer case indexing plate and cross member allows the user to index or rotate the transfer case downward to correct the driveline angle on large lifted applications. While designed for the 2011-13 Ford F-250/350, it can also be considered for the task of clocking the T-case on your diesel swap when using the Ford driveline.

**PMF Suspension**

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**PMFSuspension.com**



## Cummins 5.9L Swap Harness

The Painless harness was the first aftermarket harness to facilitate the transplant of a Cummins diesel engine; this harness is professionally manufactured by Painless Performance with all new components that meet factory specifications for durability and performance. This harness fits the 2003-05 5.9L Common Rail engines. It works with manual transmissions only.

**Painless Performance Products**

**817.244.6212**

**PainlessPerformance.com**



## Comprehensive Auto Trans Kit

No one likes to make repeated trips to the hardware or parts store to finally have everything needed for a diesel conversion. If one-stop shopping is what you're after, the comprehensive Ford Cummins conversion kits from Diesel Conversion Specialist are ready made to make the conversion as seamless and complete as possible. Kits include everything from the motor mounts to the A/C manifold, an installation manual, live tech support and even transmission tuning for the late model Ford trucks. Also available for manual trans Fords.

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### **ATS Diesel (4R100 Conversion-Cummins)**

ATSDiesel.com

### **4BT Swaps (Forum)**

4BTswaps.com

### **4x4 Labs (Mercedes diesel adaptors)**

4x4Labs.com

### **Acme Adaptors (Suzuki Samurai)**

AcmeAdaptors.com

### **Advanced Adapters**

AdvancedAdapters.com

### **BT Diesel Works (Duramax Harness)**

BTDieselWorks.com

### **Coty Built (Jeep-TDI)**

CotyBuilt.com

### **Bruiser Conversions (Jeep)**

727.709.0239

BruiserConversions.com

### **Diesel Conversion Specialists (General Conversion Support)**

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Destroked.com

### **Diesel Toys (Toyota)**

DieselToys.com

### **Eco Off Road (Toyota)**

Eco-OffRoad.com

### **Gale Banks Engineering**

BanksPower.com

### **H-Line Conversions (Hummer-Duramax)**

HLlineConversion.com

### **JD Jeeps (Jeep)**

JDJeeps.com

### **Mash Motors (Hummer)**

MashMotorsInc.com

### **Mercedes Diesel 4x4 (Mercedes)**

MercedesDiesel4x4.com

### **Overland Diesel (Kubota)**

OverlandDiesel.com

### **Pacific Performance Engineering (Duramax Specific)**

PacificP.com

### **Painless Performance (Cummins Wire Harness)**

PainlessPerformance.com

## Predator Hummer

We stopped by Predator while building this issue and were impressed with what they have going on. The entire place was packed with H1's, H2's and HMMWV's in various stages of modification. They do more than just a simple drivetrain swap and have many different proprietary modifications that make these prior military vehicles more suited for civilian use, without taking away any strengths.

### **Predator Hummer (H1, H2 and HMMWV Conversions)**

PredatorInc.com



### **Rocky Road (Samurai-TDI)**

Rocky-Road.com

### **Screamin Seeman Off Road (Cummins-Chevy)**

ScreaminSeemanOffRoad.com

### **Standalone Solutions (Duramax Wire Harness)**

StandAloneHarness.com

### **TD Conversions (General Conversions)**

GasToDiesel.TDConversions.com

### **Tennessee Diesel Conversions (Cummins Specific)**

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# THE RESTO RAM

Darrell Reese's Awesome  
Cummins Powered '85  
Dodge W350 Crew Cab

TEXT BY CHRIS TOBIN  
PHOTOS BY CHRIS TOBIN AND JORDAN UNTERNAHER

**D**iesel World isn't partial to any one scene or type of guy who runs a compression engine. We enjoy discovering and celebrating owners of a vast variety of machines, from economical sedans to monstrosously powerful pulling machines to dedicated race trucks and everything in between. Darrell Reese is one of those guys that fit in between—as a dyed-in-the-wool Mopar guy, he's owned a wide variety of project vehicles, including: a '69 Coronet, '71 Dart, '74 Dodge truck and a '93 Dakota rock crawler, all of them with various stages of customization and capability. Like many gear-heads, he was always tinkering with his cars and trucks and the collection kept growing, but none of the rides truly satisfied him and his wife Keely.





**"REESE FOUND THE TRUCK IN  
THE WOODS WHILE DRIVING  
THROUGH WEST VIRGINIA  
OVER TEN YEARS AGO"**







## FORGOTTEN FIND

Reese has owned the '85 Dodge W350 seen here quite some time now, finding it in the woods while driving through West Virginia over ten years ago and purchasing it to go along with the other Mopars in his collection. The original engine, however, made the truck a dog to drive, so to have more fun, he installed a built V8 gasser. But riding in the leaf-sprung truck was still terrible, leading the truck to sit more than it was driven. When Reese's automotive aspirations and collecting began to overwhelm their home in Junction City, Ohio, Keely encouraged him to acknowledge his gear head disease and to try and focus on one project vehicle that would make the couple happy.

## LONE PROJECT

The goal was to build a vehicle that would be all encompassing, first and foremost a daily driver with modern-truck amenities, but also a workhorse that could

pull double duty as a play truck but also look nice enough to qualify as a show truck. Reese decided that his '85 Dodge had the potential to become the truck of his dreams. He sold the other projects to help fund the W350 build and help him focus on just one project. While the truck had only 27,000 miles when he purchased it and had not been driven a lot over the years, it was also pretty bare and needed a lot of work to become his dream truck. With the help of friends and family, he pulled the Dodge into his small two-car garage and went to work.

## FRAME-OFF RESTO MOD

Not really having a definitive plan but knowing he wanted to go as far as he could with the truck, he stripped it down to the frame and let it take on a life of its own as the build progressed. Reese started by stripping the truck down to the chassis, removing the cab, bed, and drivetrain. He then sent the body over to Kaleb

Shumaker at Far From Stock Restyling in Junction City, Ohio, to straighten, smooth and paint it before it would be reunited with the chassis. Then he sandblasted the chassis before rolling it back into the garage at which point he realized that the leaf-spring suspension was never going to give him the ride that he wanted out of the truck. To give him the smooth ride he desired, he began to think about running an air suspension system.

Rather than trying to adapt a basic air suspension system to the truck, Reese thought if he was going to build something adjustable, he might as well make it extremely adjustable, so he started designing a long travel system that would allow over 14-inches of ride height adjustment with large air bags on all four corners of the truck. After diagraming suspension pickup points and frame cuts in his head, he headed into the garage for a long sleepless night with the band saw where the leaf-spring chassis met the





The crew cab W350s were discontinued before Dodge started using the Cummins engine, but that didn't stop Reese from building his dream truck with a compound turbocharged Cummins 12-valve power plant.



While it's hard to see the lower turbo, you can trust us that it's there; also, notice the suspension support that ties the two airbag mounts together over the engine.

point of no return and the unique air-system that would come to be the truck's trademark feature was born.

## REAR-END WORK

The rear of the truck rides on a Dana 80 axle from a '96 Dodge that is stuffed

with a Powr-Lok differential and 3.54 gears. It is hung under the chassis with a three-link long arm suspension designed and fabricated by Reese with Ruff Stuff Specialties components. The lower control arms are simple straight runs from the frame to the axle housing with bushings at

the frame and large Heim joints at the axle. He designed a complicated multi-piece upper wishbone for the upper link that runs from the outside of the frame rails down and under to the center of the upper axle mount above the differential with a single huge Heim joint to allow



articulation. The wishbone upper design was necessary to clear the factory fuel tank. Each Firestone 10-inch air bag is mounted outside the frame with custom buckets then tied directly into the axle. The air bags were sourced from a semi-trailer application so they will support plenty of weight. To tame the ride he used a pair of Bilstein 5100 series piggy-back reservoir shocks along with a Hellwig anti-sway bar he adapted to work with his custom suspension.

## FRONT SUSPENSION

The front end of the truck rides on air as well, with a matching set of 10-inch Firestone airbags sandwiched between a pair of Bilstein remote reservoir 5100 shocks on each side. Reese fabricated new mounts to secure the airbags to the frame as well as a bolt-in truss that links the two mounts together across the top of the engine. The Dana 60 axle housing was widened four inches and is located under the chassis with a pair of custom three-link lower control arms that were fabricated to prevent it from rotating under the truck. A Panhard bar is utilized to keep the axle assembly from uncontrolled lateral movement below the truck as the suspension cycles through its travel while another Hellwig anti-sway bar is used to control body roll. Limit straps are used on all four corners of the truck to prevent the suspension from overextending.



Looking under the rear of Reese's truck, you can see the repurposed Hellwig anti-sway bar as well as the Bilstein shocks and massive 10-inch Firestone airbags all tied in to the Dana 80 axle.



From the front side of the rear axle you can see the straight lower links and the complex wishbone upper link that allows the axle to have 14-inches of adjustable range.



Reese fabricated mounts on the frame rail to mount the 10-inch Firestone airbags. You can also see the rest of the wishbone upper link in this photo.



Each front corner of the truck is treated to a pair of Bilstein shocks on custom mounts flanking the Firestone airbag. Notice the upper support that ties the bag mounts together side to side over the engine.



From the rear of the front axle you can see the three-link trailing arms that Reese fabricated to keep the axle in position. You can also see the 9-gallon air tank mounted to the driver side frame rail alongside the transfer case.



Looking up from under the front of the W350 you can see the widened Dana 60 axle hung under the truck with another pair of 10-inch Firestone airbags that are surrounded by a pair of Bilstein shocks on each side.



His truck looks good from any angle, including the rear where he gives props to the sponsors that helped him build the truck with decals on the carbon fiber tailgate panel.



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## AIR BAG CONTROL

Reese uses a SmartRide air management system from AirBagIt.com to control the system with the iPhone app or a control panel he installed at the front of the fold down center console armrest. He installed position sensors on each corner of the truck to measure the ride height so that he can precisely control it going from a low slung stance with the tires nearly touching the fenders to a huge lift with tons of clearance or to ride height at the touch of the screen. An AirBagIt DC7500 compressor feeds a 9-gallon air tank mounted along the frame rail between the AirDog lift pump system and the fuel. The compressor and an Optima Red-Top battery are mounted along with the support modules wiring and hoses in a fabricated box under the bed with an access panel cover through the floor of the bed. The

truck rolls on a set of 35.0X14.50R22LT Super Swamper IROK tires wrapped around black 22X14-inch Fuel Octane wheels.

## BODY WORK

Reese's wild suspension design wouldn't be nearly as impressive if he bolted the beat-up 30-year old body onto the chassis. Thankfully, while he was working on the chassis and suspension, Shumaker and his team at FFS were whipping the body into shape. After making the body straight, he laid the great looking Chrysler inferno crystal pearl coat Pro-Spray paint onto the body to give the truck a unique look while keeping true to Reese's Mopar roots. Color matched Scorpion bed liner coating was sprayed inside the cab to form a headliner as well as on the bottom of the cab and rocker panels for paint pro-

tection. The pickup bed features a black Scorpion liner to offset the bold body color and match the matte-black finish on the hood and top of the front fenders. The door handles, mirrors and grille were also treated to the matte-black finish and the custom FFS grille is backed with steel mesh for a unique look. To make the tailgate pop, the back panel features a carbon fiber insert with sponsor decals along the lower edge.

The front and rear factory bumpers were replaced with fabricated plate steel bumpers that Reese built to smoothly integrate into the classic body lines of the truck. Two SR-Series 30-inch Rigid Industries LED light bars are integrated into the center of the front bumper flanked by a pair of smaller Rigid D2 HD lights to blast through the darkness on the Ohio back roads. Surface mount D2 lights are

Reese's 1st gen truck has a great look, combining modern components, colors and design. He fabricated the bumper himself from steel he had lying in the field at his house and installed Rigid LED lighting to cut through the darkness.



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From this series of shots you can see the range of suspension adjustment that Reese's truck has. The first shot is at its maximum height followed by his daily driver ride height and finally the low slung show look.

integrated into the rear bumper/roll pan to help Reese light the way when backing up.

## INTERIOR

To give the truck the modern creature comforts he wanted, Reese installed front seats from a '99 Dodge Quad Cab and the rear bench seat from an '06 Mega Cab. He recovered the seats with a two-tone leather kit from LeatherSeats.com with dark graphite and light grey leather inserts. The truck also features a modern audio/video system with a touch-screen Pioneer head unit in the dash feeding a pair of Kicker amplifiers mounted behind the fold down rear seat in the corners of the cab. The four-channel KX 400.4 powers the front and rear Kicker KS65 door speakers while the mono KX 800.1 powers a pair of Kicker RT10 10-inch subs mounted below each front seat.

## POWERTRAIN

Knowing he wanted the truck to be seriously powerful, he chose to ditch the gasser and drop a '92 5.9L Cummins 12-valve into the W350. But before installing the Cummins, he wanted to give it a few upgrades so with the help of his friend Steve Cole, they refreshed the engine in the garage. The head was sent off for a mild port job and machined for O-rings in addition to a new set of spring keepers and retainers. While they reused the stock crank, pistons and rods, they swapped out the cam for a Jams Performance Hot-Street camshaft to actuate the valves. The cylinder head was then bolted down with a set of ARP head studs to keep the pressure inside the cylinders.

Fueling was handled by an AirDog fuel pump/filter system that delivers plenty of #2 to a modified 215 P-pump with 5K springs and full cut delivery valves and a modified AFC housing that feeds a set of

## "REESE CHOSE TO DITCH THE GASSER AND DROP A '92 5.9L CUMMINS 12-VALVE INTO THE W350"



Reese mounted a pair of Red-Top Optima batteries on the driver side of the engine bay to turn the big Cummins over with no problems.



Moving inside the 30-year old truck, you'll find two-tone leather covered modern truck seats. Reese mounted the AirBagIt.com SmartRide system controller on the front of the fold down center console armrest where he would be able to make easy adjustments as necessary without fumbling around for his iPhone or app.



Looking into the bed you can see the Diamond bed liner coating as well as the 7-inch stack. The removable access cover is lifted off to reveal the air system compressor as well as a dedicated Optima Red-Top battery for the air system.

5X14 nozzle injectors. Exhaust outlet is channeled from the head into a three-piece second-gen manifold with a compound turbo setup featuring a 62/71/90 over an HT3B that Reese replaced with an S480 just before we went to print. The compressed intake charge is handed off to a Banks Power intercooler from a Super Duty before being channeled into the head through a custom boost tubes. Spent exhaust gasses are directed into the air through a miter-cut 7-inch exhaust stack mounted to the floor of the bed. He estimates that the truck makes around 600-650 horsepower with well over 1,000 lbs-ft of torque making the truck very fun to drive whenever he mashes the loud pedal.

The potent Cummins engine is backed with a NV4500 manual transmission that was upgraded with a billet input shaft and cryogenically treated internals. A South Bend Clutch 3850 dual disk clutch is used to channel the power from the engine to the transmission. Cole and Reese also fabricated new driveshafts with 1410 U-joints to get the power from the transfer case to the front and rear Dana axles.

Like most gear heads, Reese doesn't consider his truck completed, and he still has more work to do on it, like finishing off the interior with some more custom touches. But he has already built a great looking truck with the power, comfort and amenities of a modern truck combined with the cool lines of a classic first-generation Dodge with a good bit of customization thrown in for good measure. In addition to driving and enjoying the truck around town, he also takes it to major events like the Mopar Nationals and diesel favorites, like the Scheid Diesel Extravaganza and TS Performance Outlaw events where he has won several show-n-shine awards. **DW**





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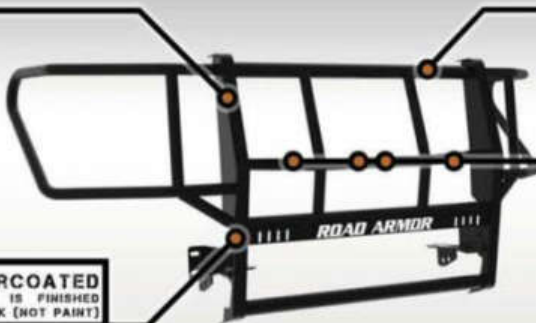


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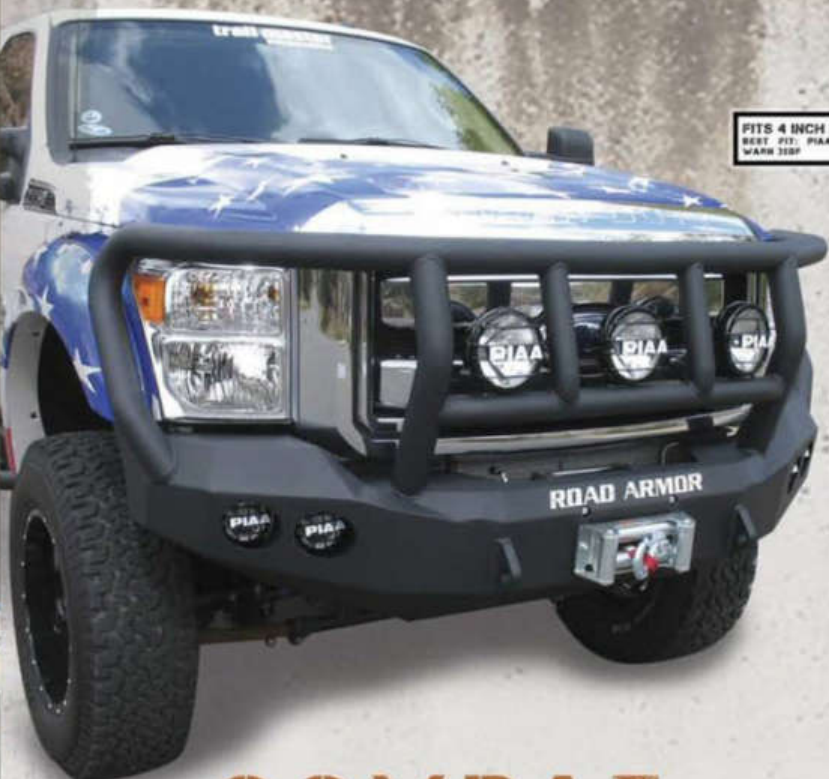
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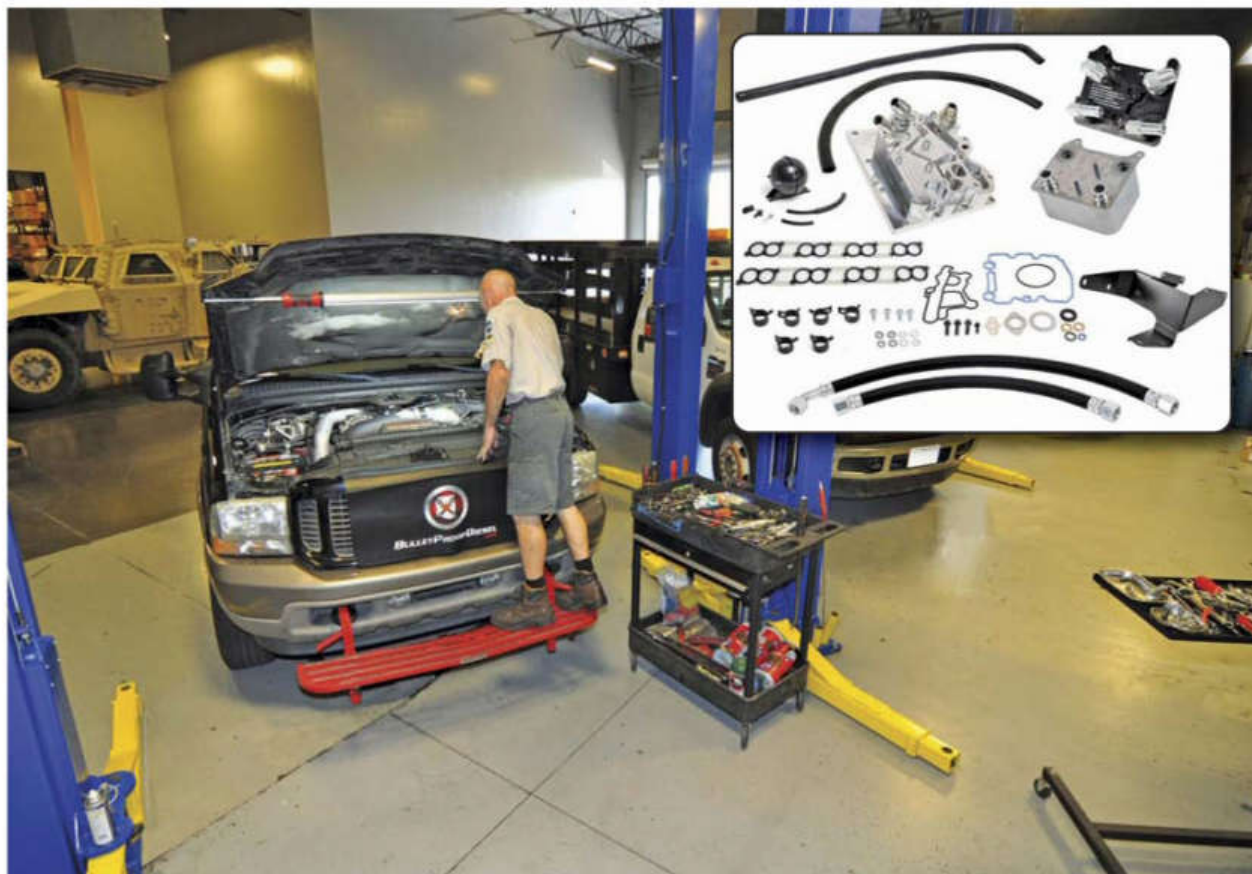
## Bullet Proof Diesel's Remote Mount 6.0L Power Stroke Oil Cooler

BY ADAM BLATTENBERG

Over the last decade or so Bullet Proof Diesel in Mesa, Arizona, has become famous with making the unfortunately infamous 6.0L Power Stroke reliable again. The 6.0L was plagued with multiple issues from the word "go." One of these problems is with the engine's oil cooler. It's a stacked plate heat exchanger design that uses engine coolant to also cool the engine's oil. The coolant and oil run through multiple separate passageways that are extremely narrow and close together. It really does do a good job of keeping the oil cool, when clean. Unfortunately, due to left over sand from the casting process, excess gasket material and supplemental coolant additives among other contaminants found suspended within the cooling system, the oil cooler can clog fairly often. This will cause raised oil temperatures and reduced coolant flow to the EGR cooler which will eventually result in damage to the EGR cooler, injectors and more.

While the oil cooler is not an overly expensive part, changing it is extremely time consuming. It can be a multiple-day job. So Bullet Proof Diesel came up with yet another 6.0-liter fix and engineered a kit that would allow for the factory oil cooler to be mounted remotely, making servicing it a quick 30-45 minute job. The factory oil cooler will still function exactly as the manufacturer intended it to; it will just be mounted in an easily accessible location. The kit consists of an engine oil transfer block that

mounts in the valley of the engine where the oil cooler originally lived. This block is billet machined from high quality aluminum and takes the supply and return of oil and coolant and reroutes it to the new oil cooler location, which is near the passenger side battery. It's an impressive kit with very high-end parts. The install took roughly two days, and once done, it looked almost factory under the hood. **DW**







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**1** Here's a cutaway of a clogged factory 6.0L Power Stroke oil cooler. Here you can see the oil and coolant galleries stacked on top of each other. The narrow rows that are visibly clogged with orange material are for coolant, and the slightly wider rows are for oil. When a cooler clogs like this one, it becomes less efficient and can lead to EGR cooler issues and eventually injector problems.



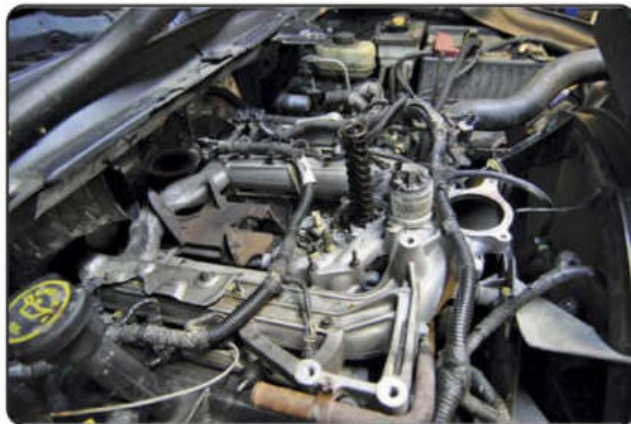
**2** A multitude of things need to be removed to access the oil cooler. The first thing Bullet Proof Diesel Technician Delwin Wamsley did was remove the grille to protect it from scratches. Wamsley then started draining the coolant, removed both inter-cooler tubes, air intake, Degas bottle, alternator and the FICM (still installed in this photo).



**3** Mounted directly atop the oil cooler is the oil filter and fuel pressure regulator. This assembly needs to be removed to access the oil cooler but will also get in the way during turbo removal.



**4** In just a few minutes, Wamsley had our Stage-2 turbo from KC Turbo out of the truck.



**5** Next to come off the engine were the intake, turbo pedestal and EGR cooler. The intake was then taken to a local shop for sonic cleaning to rid the inside of any soot and oil build up. Just a smart extra step Bullet Proof Diesel takes to remove restriction in the intake and prevent contaminants from entering the cylinders after start up.



**6** This is the factory oil cooler assembly. Most of it will be replaced with new Bullet Proof Diesel parts. The black tube is what the oil filter surrounds.



**7** After removing the oil cooler assembly, Wamsley spent some time cleaning the engine valley until it was "surgically clean." The rags are there to make sure nothing accidentally falls into the engine intake. If that were to happen, the head—or heads—would most likely have to be removed.



**8** The oil cooler assembly comes apart in multiple pieces.





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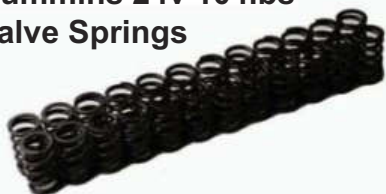
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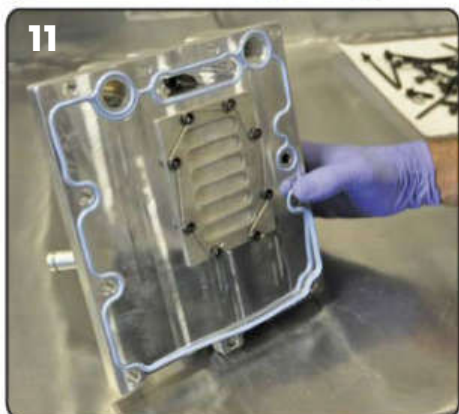




**9** Here's the factory oil cooler found bolted to the bottom of the assembly.



**10** Next Wamsley readied the new Bullet Proof Diesel engine oil transfer block for installation by bolting the factory oil filter assembly to it using some of the factory bolts and a few replacement ones provided by Bullet Proof. He also installed all new gaskets and swapped any sensors over.



**11**

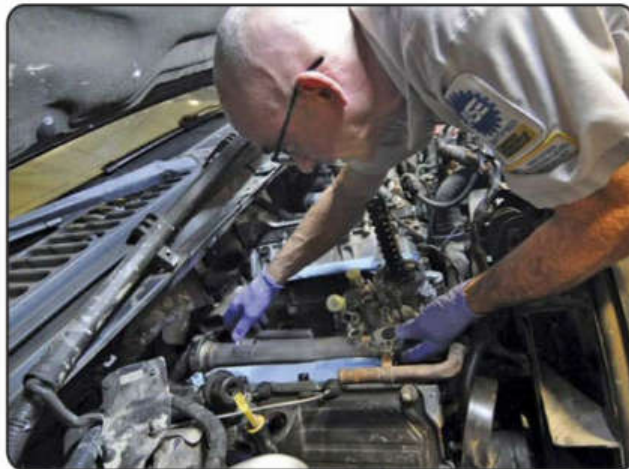
**11 & 12** The new Bullet Proof block simply reroutes the oil and coolant to another location where the oil cooler sits. Used coolant and cooled oil then returns back to the factory Ford locations it did prior to the install. Cooled oil drops down below the unit through the HPOP filtration screen seen here. It's much more robust than the factory screen which is prone to failure. Photo 12 shows our clogged factory screen next to a new factory screen. Ours was pretty bad.



**12**



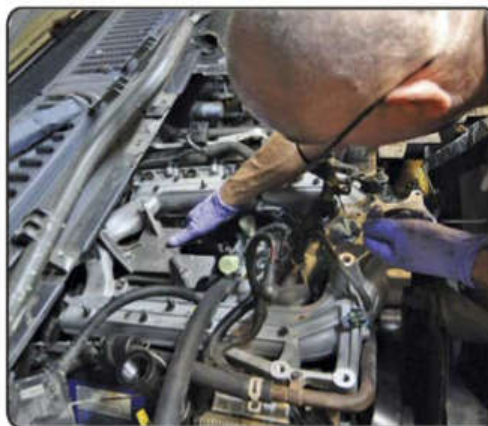
**13** The new unit was then bolted back into the factory position in the engine valley.



**14** Our EGR cooler had no issues (that we knew of) but in the interest of preventative maintenance, and because, well, we were at Bullet Proof Diesel (the inventors of the famous upgraded tube-style EGR coolers) we replaced ours with a Bullet Proof EGR Cooler.



**15** The factory unit (NOT pictured here) is a tube-and-shell heat exchanger design. The passageways are very narrow and can fail easily sending coolant into the cylinders. If it leaks bad enough, it can bend a rod or worse. Bullet Proof Diesel's EGR cooler (seen here) uses 6 welded stainless steel tubes jacketed with coolant to lower EGT's into the intake. It's a much, much stronger unit.



**16** With the Bullet Proof Diesel EGR Cooler in place, the intake and turbo pedestal were installed. Notice the attention to detail BPD takes: Del Wamsley even sand blasted the pedestal and hit it with a good coat of WD-40 to prevent any rust.



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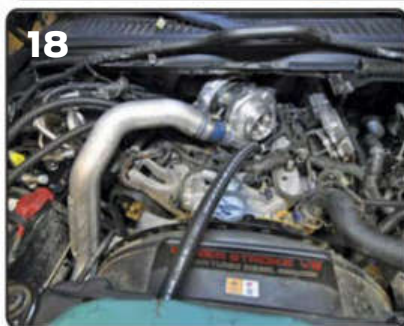
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17

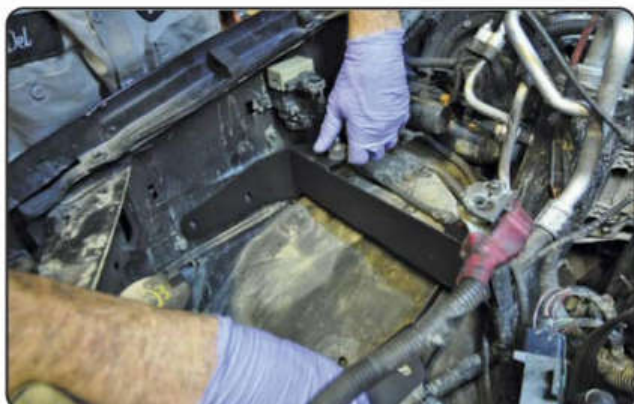


18

**17 & 18** Before reinstalling the turbo, Wamsley hooked up a coolant line that would be inaccessible after the turbo was in. He then installed the turbo and began running the remaining three out of four lines from the Bullet Proof oil transfer block to where the other end of the kit, the factory oil cooler and Bullet Proof Relocation Plate assembly would be mounted.



**19** The new location for the oil cooler will be behind the passenger side battery. Removing the battery is step one of this half of the install.



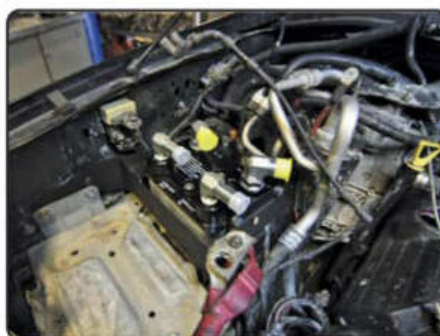
**20** After removing the battery, battery tray, and factory vacuum canister, Wamsley bolted this bracket that the new oil cooler assembly would mount to. It's rubber mounted to eliminate any noise transferred from the engine to the cab.



**21** Wamsley then began to mount a new factory Ford oil cooler to the Bullet Proof Relocation Plate using new O-ring gaskets with a bit of assembly lube to aid in installation and to ensure they seal correctly.



**22** Installed and ready to be bolted into its final resting place behind the passenger battery, the black relocation plate is made by Bullet Proof Diesel and simply takes a supply of coolant and oil, sending both through the Ford cooler and then back to the engine just like the factory intended.



**23** The assembly then bolts onto the previously installed bracket using four bolts, two per side. All are easily accessible for future service as that's the point of this kit: to make servicing the oil cooler much easier than before.



**24** Previously, the factory vacuum canister was removed to make room for the oil cooler's new home. It is replaced with this vacuum canister supplied by Bullet Proof Diesel. While it's substantially smaller, it did not affect any vacuum powered accessories at all.



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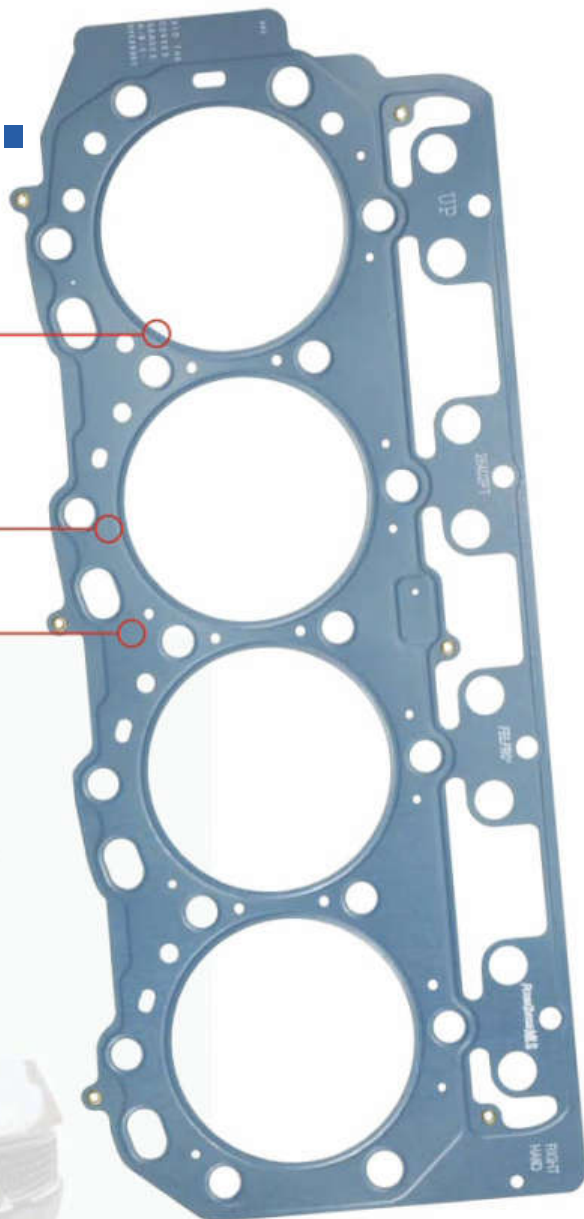
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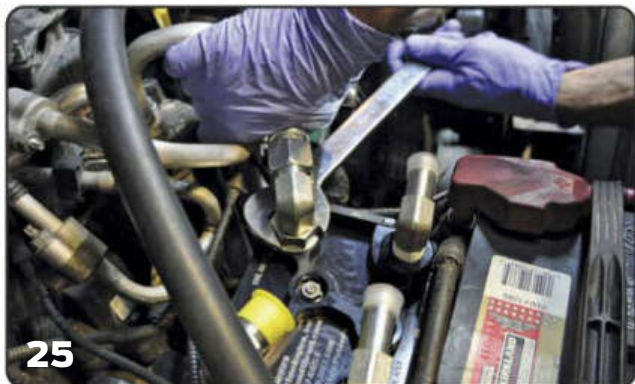


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25



26

**25 & 26** Next step: Wamsley ran all four lines (oil feed, oil return, coolant feed, and coolant return) across the engine to the new oil cooler assembly. The oil fittings were snugly tightened and aligned; then the jam nut was tightened to ensure a good leak-free seal. Coolant lines connect via push-on hoses and a pair of spring clamps just like Ford uses.



**27** After reinstalling the intercooler tubes and few remaining factory parts Wamsley filled the engine with some fresh oil and coolant.

Note: You will need slightly more of both fluids as each system is now a quart or so larger due to the new lines from the cooler to the engine. The motor was then started and checked for leaks. None were found, so we took the truck out for a quick test drive.



**28** After 20 miles or so in 108-degree weather, we stopped to check the engine oil and coolant temperatures with our ScanGauge 2. Both were perfect, indicating the system is doing its job correctly. Not that we expected anything less...

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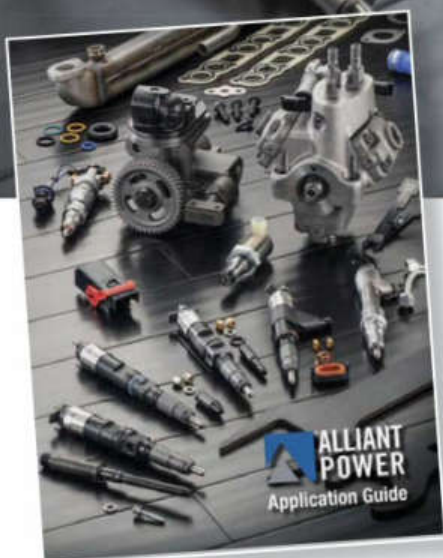
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# MILEAGE MASTERS

2015 Golf SportWagen  
Comparison Test



**MANUAL**





**AUTOMATIC**



BY TRENT RIDDLE  
PHOTOGRAPHY BY TRENT RIDDLE  
AND COURTESY OF THE MANUFACTURER

**T**he Volkswagen Golf was first introduced in the United States in 1974 and is now in its 7th generation. We wrote about the latest version of the Golf back in our September 2014 issue, when the Golf Mark 7 sedan was introduced to the press. Unfortunately, at that time, the Golf SportWagen was not yet in production. We promised then, that as soon as possible, we'd bring you the details on the new Golf SportWagen. While the wait was long, it was worth it. Recently, we had the chance to test two different trim lines of the Golf Sportswagen, one a manual and the other the automatic. They were fun to drive and impressive in many ways.

For our 2015 Golf SportWagen comparison test, we got into both an automatic and a manual transmission version of this car. The first of our drives was in manual transmission, seen here in blue. The manual proved to be the mileage master of the two. The DSG automatic car, seen here in red, was not as frugal on fuel as the manual. However, it bested the EPA-rated 42 highway on the open road routinely during our testing. Both were fun to drive and got great mileage.



## ADVANTAGES AND DISADVANTAGES

Our two testers were a blue S trim that had a 6-speed manual and a red SE trim with the 6-speed DSG automatic. Of course, both were equipped with the new EA288 2.0 L diesel engines. The new TDI 4-cylinder is smoother and quieter than the last generation engine and produces 40-percent fewer emissions too. Technological improvements and the use of DEF fluid make this possible. Yes, VW finally had to introduce DEF fluid in anticipation of ever increasing emission restrictions to come. It's not all bad; the DEF fluid

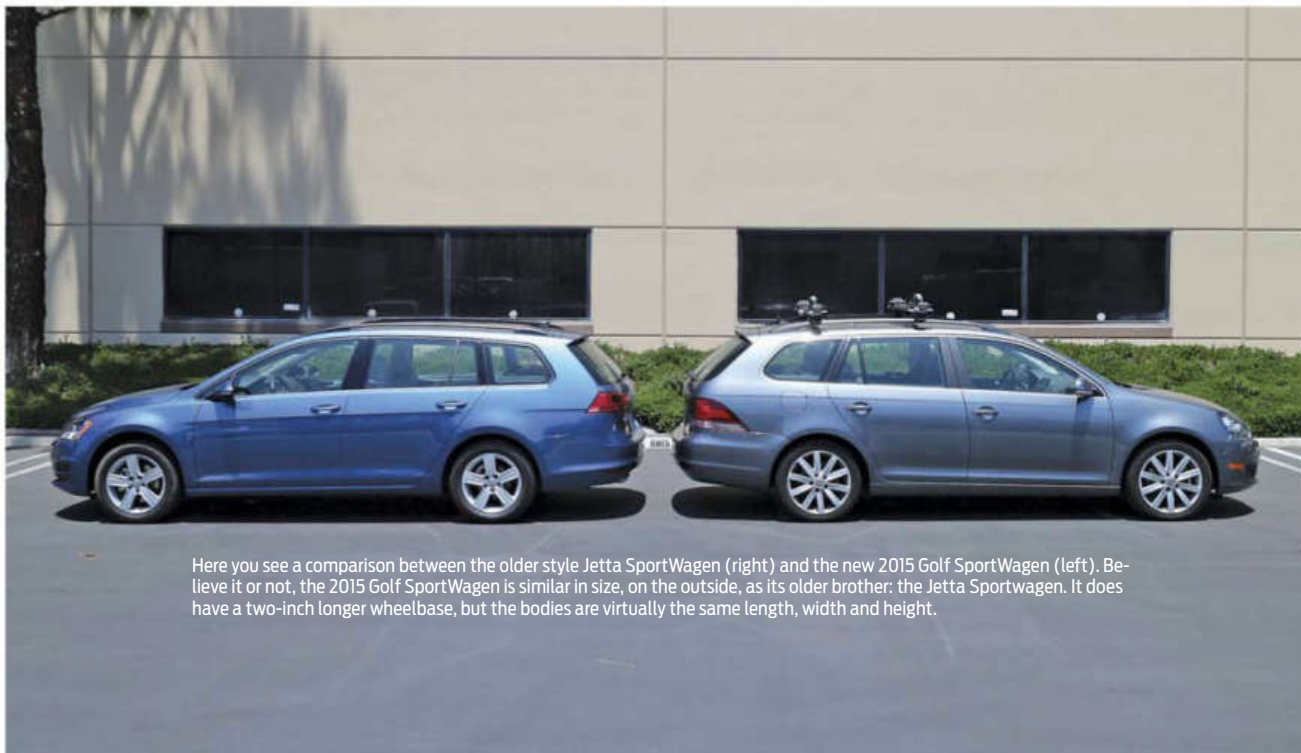
does allow for more tuning options, and the overall results are more horses from this new 2.0L and even better mileage.

Overall, both the new Golf SportWagens proved to be comfortable, fun to drive and frugal on fuel. Overall, the new Golf SportsWagen is spacious enough for two adults and three dogs to take a road trip across two states. While the TDI can fit in any-size garage or carport, it is also big on features and capacity. Best of all, the TDI diesel offers some of the best mileage we've seen out of any diesel we've driven. **DW**



The 6-speed manual transmission (A) is well matched to the RPM needs of the diesel engine. It was smooth shifting and seemed perfectly geared for the little diesel under the hood. We found that properly driven, it will best the automatic in the mileage department. The DSG automatic (B) has a shift gate that allows it to be driven as an automatic manual for a more sporty driving experience, or as a standard automatic: Put in into "D" and forget about it.

The new generation of 2.0L TDI engines, the EA288 family, requires DEF fluid. This was inevitable, as emissions standards are becoming more restrictive. When looking up DEF in the owner's manual, it is listed under ADBLue. In Europe, Australia and New Zealand, Diesel exhaust fluid (DEF) is commonly referred to as ADBLue. Thus, all European cars sold in the USA refer to DEF as ADBLue in the manuals.



Here you see a comparison between the older style Jetta SportWagen (right) and the new 2015 Golf SportWagen (left). Believe it or not, the 2015 Golf SportWagen is similar in size, on the outside, as its older brother: the Jetta SportWagen. It does have a two-inch longer wheelbase, but the bodies are virtually the same length, width and height.



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The 2015 Golf SportWagen is a great car for the family or singles with active lifestyles. It is compact and easy to maneuver in traffic, and has the capacity to carry lots of gear for weekends away.

**SPECS:**  
**2015 VEHICLES:**  
**Volkswagen Golf SportWagens**

Two were tested: an S package-manual and SE package with DSG Auto.

**ENGINE TYPE:** I-4, Turbo Diesel

**DISPLACEMENT:** 2.0L (122 cid)

**HORSE POWER AND TORQUE:** 150 hp, 865 lb-ft.

**FUEL CAPACITY:** 13.2 gallons

**TRANSMISSIONS:** 6-speed manual on S package and 6-speed on DSG automatic SE

**EPA MPG RATING:** 31 city; 43 Highway; 35 combined for both transmissions.

**OWNER ESTIMATES AT PRESS TIME:** 44.6 MPG (See: FuelEconomy.gov)

**BEST TANK DURING TESTING:** 64.3 MPG in the manual.

# MILEAGE MASTERS



The Golf SportWagen is roomy enough for a mountain bike or a few dogs in the back. If you lead a sporty life, or have a large family, the extra room will be much appreciated. Compared to the last generation Jetta SportWagen, this model has slightly more passenger space and legroom.



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Here you can see a comparison of the Golf SportWagen's cargo capacity with the rear seats up and folded down. This little car has lots of carrying space: 30.4-Cu. Ft. with the rear seats up and 66.5-Cu. Ft. with them down.



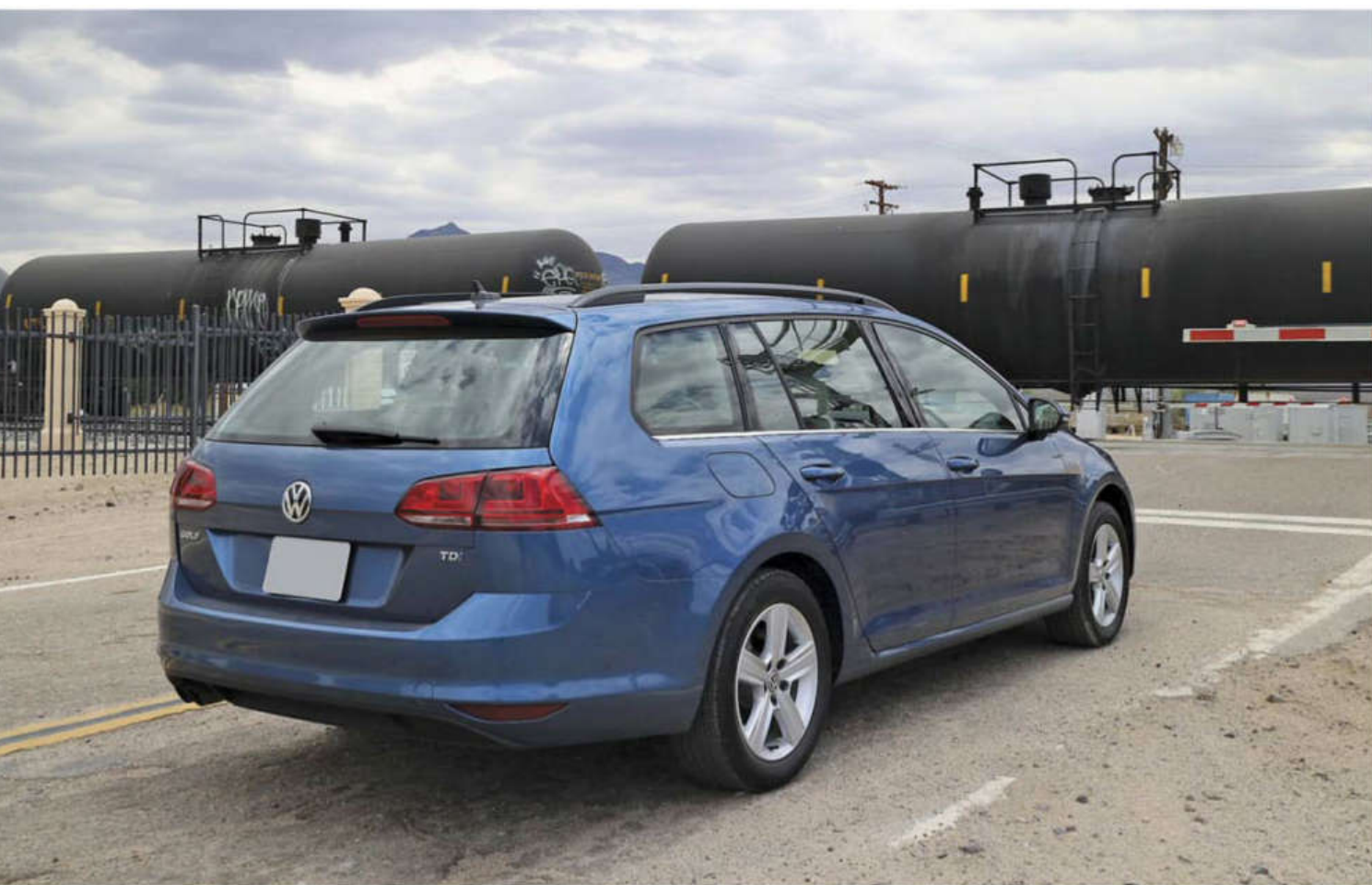
The climate control system is split to offer different levels of air temperature to the vents on each side of the passenger compartment. This potentially relationship-saving function is standard. The seats were also heated separately.



The 2015 Golf SportWagen has an odd triangular window right over the dash at the A-pillar. This helps see what would be hiding in a blind spot if the glass weren't there. In addition, we found it a great place to store your sunglasses.



The driver assist info system offers eco tips as you push along. Besides recommending up and down shifts points, it also warns that open windows eat fuel. This warning about windows is found on both the automatic and manual cars.





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The SE package comes with a monstrosously large sunroof that covers almost two-thirds of the roof. The part that actually opens to the air is about half of the total glass area.



Our best tank in the Golf SportWagen TDI manual was a 64.3-mpg tank run on the open road. Our overall average was less but still higher than the EPA number. Not bad for a 144-mile run though the Mojave.



In our travels, testing mileage on desert back roads, we found what might be the most expensive diesel fuel in California. This lone station in the middle of the Mojave Desert is the only game in town...for miles around. However, with the amazing mileage of the TDI engine, we just stopped for a photo!



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69567/60566/62532

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**PITTSBURGH**  
**RAPID PUMP®  
3 TON HEAVY DUTY  
STEEL FLOOR JACK**  
LOT 69227/62116/62584  
62590/68048 shown

• Weighs 74 lbs.

**SAVE \$80**

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US • GENERAL  
LOT 62744/68784 shown  
69387/62270/62591

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**PITTSBURGH**  
**6 TON HEAVY DUTY  
STEEL JACK STANDS**  
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62393/69596  
38847 shown

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PACK OF 100**  
**HARDY**  
• 5 mil. thickness  
MEDIUM LOT 68496/61363  
LARGE LOT 68497/61360  
X-LARGE LOT 61359  
68498 shown

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60338 shown

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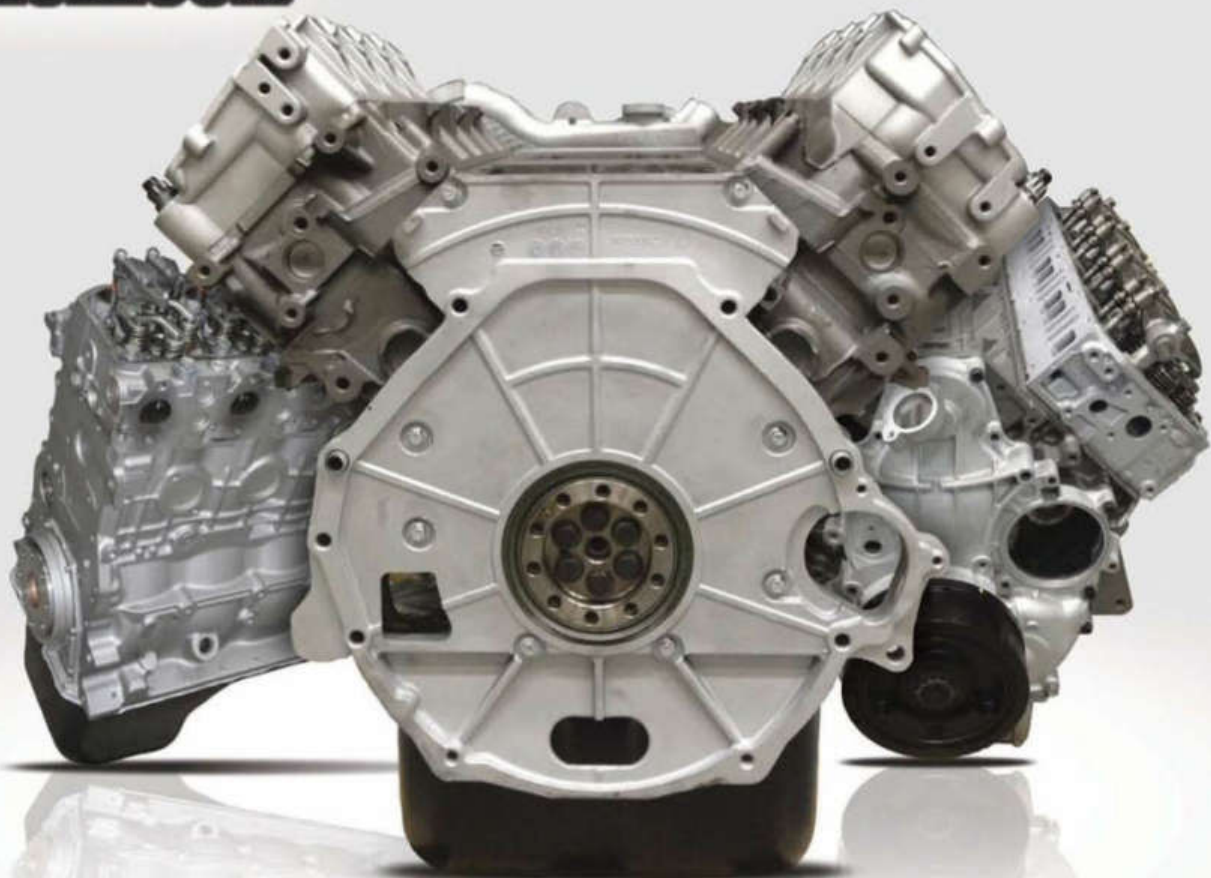
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**XTREME**

**WhiteLightning**

Red L.E.D. Brake/Running Lights, and White L.E.D. Reverse Lights.

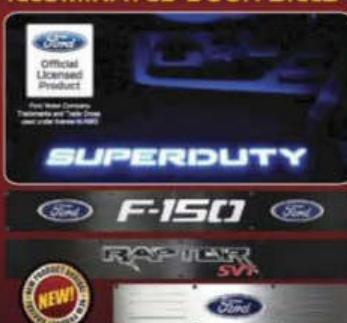
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Red L.E.D. Brake/Running Lights

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- Anodized Billet

- SUPERDUTY
- F-150
- RAM

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48" 62"

**BIG RIG ICE**



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JEEP WRANGLER  
2007-2013

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Available in Clear, Smoked, Red & Red Smoked  
Available for Ford, Dodge, Chevy/GMC & Toyota

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## LED CAB ROOF LIGHTS



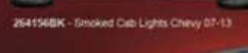
264146BK - Smoked Cab Lights Dodge 03-13



264143BK - Smoked LED Cab Light Kit Ford 99-13



264155BK - Smoked Cab Lights Chevy 02-07

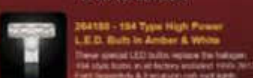


264156BK - Smoked Cab Lights Chevy 07-13

Along with Smoked, RECON cab lights are also available in the following lens colors:



**NEW LED Strobe Cab Lights**  
with adjustable flash patterns are  
Now Available!



264188 - 194 Type High Power  
L.E.D. Bulbs in Amber & Yellow  
These special LED bulbs, housed in the halogen  
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LED Running Lights / Turn Signal  
lenses for 2009 to 2013 Ford F150 &  
Ford RAPTOR pickup trucks.

264241BK - Ford 09-13 F150 & RAPTOR  
Amber LEDs - Smoked  
264241CL - Ford 09-13 F150 & RAPTOR  
Amber LEDs - Clear



264140BK - SMOKED 08-13 Ford  
SUPERDUTY Side Mirror Lenses



264120CL - Clear 03-07 Ford  
Superduty Side Mirror Lenses

264120BK - Smoked 03-07 Ford  
Superduty Side Mirror Lenses

## LED FENDER LENSES



2011-2013 Ford SUPERDUTY 264136BK  
2010-2013 Dodge RAM 264137BK

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Bullet-Style Ultra High Power 6-Watt  
S.M.D. Bulbs - WHITE



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10MM X 42MM 6 S-B  
LED HIGH-POWER BULBS

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S.M.D. LED's on each bulb - WHITE



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RECON's Newest LED Bulbs  
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HEADLIGHT BULBS.



New for 2011-2013  
RECON's High  
Intensity Discharge  
aka HID headlights  
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## LED 3RD BRAKE LIGHTS



264113CL - Clear Toyota  
Tundra 07-13

264116BK - Smoked Ford  
Superduty 99-13 & Ranger  
99-13 & Explorer Sport Trac  
01-05 LED 3rd Brake Light

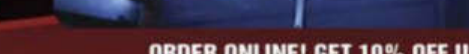
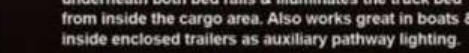
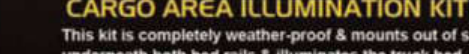
264112BK - Smoked Dodge  
RAM 09-13 1500 & 10-13  
2500/3500

264118BK - Smoked Dodge  
RAM 02-09

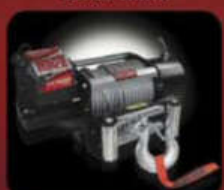
264111BK - Smoked Ford  
Raptor & F150 09-13

264115BK - Smoked Chevy  
& GMC 09-13

RECON clear and smoked L.E.D. 3rd brake lights are simple to  
install and are a direct replacement for your OEM factory installed  
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# Transfer Case Transformation

## Installing a PPE Pump Rub Upgrade and T-Case Brace Kit in a 2002 GM 2500 HD

BY JACOB WHITE

**T**he Duramax/Allison combo was a pretty solid homerun for the GM crowd right from the get-go when it was released in early 2001 for the 2500HD and 3500HD line-up. The Duramax engine in its first generation (2001-2004 LB7) offered great power and torque that only got better as the years went on (2004.5-2006 LLY, 2006.5-2007 LBZ, 2007.5-2010 LMM). However, the 6.6L engine needed a stout transmission to handle it. The Allison 1000 automatic that ended up bolted to the back of those engines was the perfect match, offering the industry's first 5-spd and 6-spd automatics and offered a Tow/Haul mode that commanded early converter lock-up and later shift points to take full advantage of the Duramax horsepower and torque bands. The engine and transmission offered a solid drivetrain capable of just about anything; unfortunately, the OEM engineers overlooked a few things that if not addressed, can lead to premature and costly drivetrain failures. An internal design flaw with the pump of the NP246 transfer case that was used in 4WD models and the lack of a cross member or support for said transfer case can lead to fluid leaks, catastrophic transfer case failure, and transmission tail housing cracks and/or transmission damage.





## THE PUMP RUB FIX

To circumvent these issues, the bright engineers of Pacific Performance Engineering, PPE, out of Fullerton, California, who have specialized in the performance Duramax market since its release in 2001, offered their expertise. Inside the NP246 transfer case used in most 2001-2010 Duramax applications, the OEM pump has five super sharp and thin tabs that can wear over time causing the oil pump to contact the rear tail shaft housing and actually create a pinhole leak. This leak, if gone unnoticed or unresolved for too long, will allow the fluid to leak out, leading many owners to drive dry, unlubricated transfer cases until they overheat, bind and explode. The simple fix to prevent all of this from happening is PPE's custom machined pump upgrade that uses much thicker tabs to locate the pump within the housings and more evenly distribute the contact pads to eliminate rubbing through the outer case.



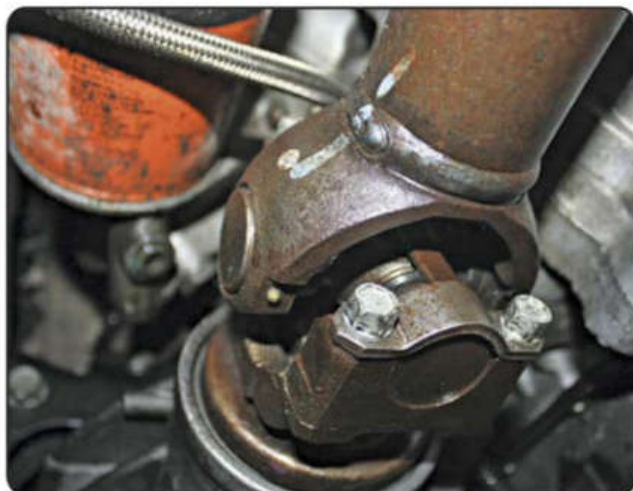
**1** The PPE Pump Upgrade Kit (shown installed here) replaces the factory style pump housing and uses much thicker tabs to hold it in place in the outer transfer case shell. The factory unit is prone to rubbing through the case creating a leak that can lead to major damage and complete failure of the transfer case.



**2** The installation of the Pump Upgrade kit must first start by removing the transfer case from the truck. This is a job that can be done in any driveway or garage; the help of a truck hoist does make it a little easier. First, start by draining the fluid by removing the lower 15mm plug located on the back of the transfer case.

## CRACKED TAIL HOUSINGS

In addition, PPE resolved the all too common problem of cracked transmission tail housings (due to the weight of the NP246 transfer case being hung off the back without additional cross members or support) in Duramax/Allison four-wheel drive models. In higher horsepower competition applications and even mild off-roading applications, the torque from the Duramax engine can be enough to put a good load on the drivelines and can lead to tailshaft failures due to the poor overhauling design. In some instances, even something as simple as a driveline being out of balance or a failed u-joint can create enough vibration in the system to break the transmission tail shaft housing. The PPE Transfer Case Brace was engineered to be bolted in above the transfer case to help distribute some of its weight to the transmission's center section and add some rigidity to the drivetrain. Best of all, the brace can be installed without having to remove the transmission or transfer case, requiring the most basic of hand tools. **DW**

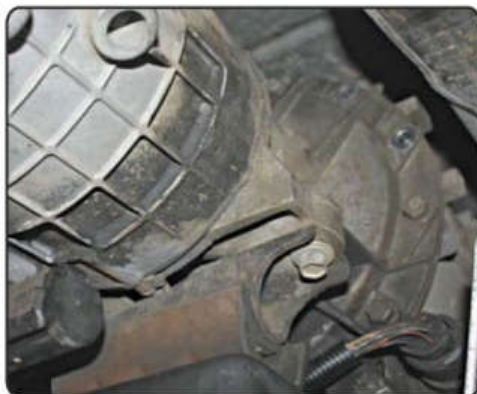


**3** With the case drained, you can then remove the front and rear drive shafts. Both shafts use slip joints at the transfer case, but two straps held in with bolts will need to be removed on the axle side. A pry bar will help bump the u-joint out of the pinion. If your u-joints have any noticeable play or a lot of miles on them, now may be the right time to change them out with new units.



**4** After placing a floor jack under the transmission to support its weight, the transmission cross member can be taken out. It is bolted to the frame rails with four large 18mm bolts, two on each side. The outer L-shaped bracket will need to be removed as well.





**5** The cross member attaches to the transmission with just two bolts through the mid-mount. Our tech opted to remove the bolts that attached the cross member to the mount, then removed the cross member from the truck. After it was out of the way, accessing the mounts bolts that attach it to the transmission itself was much easier.



**6** The next step in the removal process is to disconnect all the electronics, like this one shown plugged into the electronic shift selector. There are also a couple cables that are mounted to the transfer case that will need to be removed.



**7** The last step is loosening and removing the six 15mm nuts that hold the transfer case tight to the back of the transmission. While the transfer case had previously been drained, you will still get some fluid from this once the seal of the gasket is broken, so be prepared.



**8** With the help of a friend, the transfer case can then be slid back far enough to clear the mounting studs. It will need to be tipped up at an angle to slide it down past the rearward cross member. You'll want to discard the old front gasket as a new one is supplied with the new PPE Pump Rub Kit.



**9** Disassembling the transfer case further will require an internal snap ring to be opened and slid off the main tail shaft. To access this snap ring, the rubber grommet needs to be removed, along with the tail shaft speed sensor.



**10** Before going further, this location of the rear case housing is where the pump will rub through. While this truck has 150,000 miles on it, the pump has not yet rubbed completely through, so luckily this "preventative maintenance" looks to have happened at the perfect time, preventing the major expense incurred when a dry transfer case explodes and sends parts flying.



**11** This is the snap ring that is found inside that rubber grommet; you'll need a good pair of external snap rings to open it up enough that the tail shaft can be slid forward enough to come loose of the snap ring.



**12** With the snap ring pliers holding the snap ring open, a long flat-head screwdriver can be slid in through the speed sensor port to help slide the tail shaft forward, releasing the hold within the rear transfer case housing.



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**13** With the rear snap ring and the rear shaft disengaged, the outer case bolts can be removed. The use of a cordless impact or air impact is going to come in handy here as these bolts are snug and will have some sealant on them, so they won't come out easy by hand. Take note of which bolts have brackets attached to them as they'll have to go back in the same place.



**14** With all the external bolts removed, a long handled pry bar can be used on each side of the transfer case to break the seal between the two halves. Once it's split apart, the rear housing can be lifted straight off, and the old gasket sealant will need to be cleaned off.



**15** This shows the inside of the rear case where the transfer case pump housing rubs. This transfer case has just rolled over 150,000 miles and is definitely showing signs of rubbing. While the metal clip is still intact, by rotating it out of the way, you can see how the knife-edge-sharp pump has been pressing it into the outer case and has started to wear and round out the case. It's only a matter of time before this would've worn all the way through, creating a leak and possible catastrophic failure.



**16** If you've never seen the inside of a transfer case, they can be a bit intimidating, but swapping out the pump itself is a fairly straightforward and easy task. The pump (located on the right) will slide right off the tail shaft once the snap ring, bearing, and gear have been removed.



**17** Pay attention to the stack-up position of the snap ring, bearing and gear as their positioning will need to be identical when it goes back together. The groove in the bearing will need to face rearward, as this is where the rear case snap ring will need to sit so that everything will hold together.



**18** This snap ring will need to be opened up and slid upward along the tail shaft and past the splines. This turned out to be the most troublesome part of the pump kit install, as the snap ring is under a bit of tension and the snap ring pliers we had kept slipping off. But after the sixth or seventh, it passed the splines and was set aside.



**19** Then the large bearing could be removed in the same fashion; it is a rather tight fit on the tail shaft, but with some finesse and wiggling it should slide right off.



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**20** The rear gear will then be removed; pay attention to its orientation on the shaft as one side of the gear is a stepped end and the other is flat. The gear will need to go back the same way, so the gear and bearing will seat properly.



**21** To remove the pump, the pick-up tube will need to be gently pulled out of the pump and the O-ring saved. Once the tube is out of the way, the pump can then be slid off the tail shaft as well.



**22** With the pump removed from the transfer case, you can finally get a good comparison between the thin stock piece (right) and the new PPE housing on the left. The new PPE unit has a much broader surface area to help distribute the load inside the housing so as not to wear through as the stock piece will.



**23** The six T-15 Torx bolts can be removed from the pump and the stock housing discarded. The PPE piece can be bolted back in place of the stocker, making sure that both pump gears are left inside the pump. The bolts will be torqued to around 80in-lbs. or about as tight as a screwdriver-type handle will allow. You'll also want to make sure that the O-ring is reinstalled into the pump to seal the pickup tube upon reassembly.



**24** Once the pump, gear, bearing and snap ring are reinstalled, the pick-up tube can be inserted back into the pump and the rear case can be reinstalled. You'll need to be sure to grab a small tube of gasket maker at your local auto parts shop to seal the cases. Make sure both surfaces are clean of the old sealant before applying a solid bead of the new all the way around.



**25** Once the cases have been put back together, the outer bolts can all be installed and torqued to 27ft-lbs in an alternating pattern. This will apply an even force all the way around the cases and create a tight bond for the silicone to create a leak-free seal. The PPE kit does include a new transfer case seal to keep the mating surface between the t-case and transmission leak free as well.





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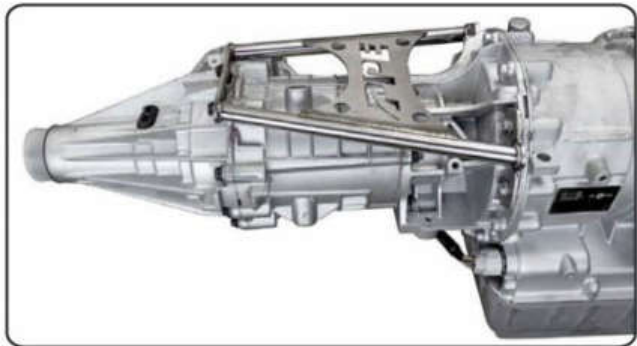
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**26** The four-wheel drive Allison equipped GM trucks that see the abuse from off-roading, drag racing, and/or even the slightest driveline vibrations (bad u-joint, bent driveline, etc.) for too long might see premature cracks develop in the tail shaft housing of the transmission. This is usually due to the weight of the unsupported transfer case hanging off the back of that tail housing. To help prevent expensive failures, the PPE Transfer Case Brace helps distribute the weight of the transfer case to the transmission's stronger center section and offer additional rigidity to the drivetrain.



**27** The fabricated stainless steel brace has CNC laser cut brackets and 7/8" tubes for optimal strength and durability. The stainless steel brace will resist rust and corrosion from any road debris and weather and can be installed with basic hand tools without removing the transmission or transfer case.



**28**

**28 & 29**  
After completing the PPE Pump Rub Kit installation and getting the re-worked transfer case installed back in the truck, there are four bolts on the center section of the transmission that need to be removed and two on the top side of the transfer case. The brace simply slides into place above the transfer case and the original bolts can then be reinstalled and torqued to the proper spec. 35ft-lbs at the transmission side and 27ft-lbs on the transfer case. **DW**



**29**

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# WHEN THE WIFE'S AWAY

What Happened to the Negative Camber Family Hauler?

TEXT BY MIKE ALEXANDER  
PHOTOS BY DIESEL WORLD STAFF

**T**his is a story that's widely understood and shared by many in the custom truck world, especially those who have been in the game for some time now. Jimmie Broyles hails from Norman, Oklahoma, and has been building and driving customs for almost two decades. He's had his fill of everything from laid-out minis to full custom Cadillacs. Bit by the custom bug when he was young, Jimmie has been cutting up rides of his own since he was 17. As a long time member of Negative Camber, he eventually graduated to the big show builds and built a few full-size show trucks and custom Cadillacs.









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A few years back, Jimmie needed a daily hauler and tow truck for a '64 Cadillac project that he was in the middle of building. Since the Cadillac was a long-term build, he would need to haul it to different shops and some shows in its various stages before it would be complete. So, Jimmie did what any one of us would do and went on the hunt for an affordable and reliable tow pig. He came across this 2001 7.3L F-350 and struck a deal for a very "stock" Ford. Although the thought crossed Jimmie's mind more than once, he vowed to keep this one stock and just use it as a hauler and work truck. Yeah, you can tell where this is headed.

### MODEST INTENTIONS

But, let's not get too far ahead of the story. Jimmie had been tinkering with the idea to just 'bag the F-350 and throw





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some wheels on it, but continued to resist the urge—until the opportunity came. His wife was out of town for a couple of weeks, and well, he happened to have all of the parts lying around in the garage. So, one night he just pulled it in and started cutting away. After about two weeks of working nights, Jimmie had the truck laid flat using a 2000 Chevy 1-ton suspension clip, 'bag-over-axle tow suspension and

custom 4-link setup. Of course, his wife had no idea this was taking place, so in the meantime, he narrowed the rear end and had a set of Moser axles built while measuring for the 24-inch American Force Raptor wheels that he had ordered to complete the look.

It was definitely all down hill from there because now the truck was sitting on the ground where it belonged. Jimmie

continued to build the truck in true Negative Camber fashion until it became what you see today. Jimmie grafted all-new 2009 front and rear sheet metal, added a custom fiberglass cowl hood and smoothed the bed. By the time it all was said and done, it definitely went a bit further than he had originally planned. The finishing touches included the bright red and traditional flame paint job sprayed by



The updated front end is finished with a complete T-Rex billet grille insert set for both the Ford grille and front bumper.



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## Truck Specs: Jimmie Broyles

2001 Ford F-350

Norman, OK

Negative Camber

### ENGINE:

Ford 7.3 Power Stroke

Custom-built air cleaner

Tucked wiring and detailed engine bay

Power-coated and painted brackets and accessories

Custom engine cover painted to match

Chrome-plated accessories and dress up

Optima Yellow Top batteries

Excursion gas tank

### SUSPENSION:

2000 Chevy 1-ton front clip

Slam Specialties bags in the front

Firestone bags in the rear

Beltech shocks

Viair 480C dual compressors

Nitrogen bottle setup in bed

Custom notch and 4-link

Bag-over-axle tow setup

Narrowed rear-end with Moser Axles

Performed by owner and friends

### ROLLING ATTIRE:

American Force 24-inch Raptors

255/30/24 Duron Tires

### BODY/PAINT:

Converted/updated to 2009 Super Duty front and rear

Custom-built roll pan

T-Rex billet grilles upper and lower

Custom cowl hood

Sheet metal bed

Shaved gas filler

Painted PPG Red by Joey Skinner

Traditional flames by Cole Stevens

### INTERIOR/STEREO:

Katzkin sandlewood leather with alligator inserts

Performed by Curt Enochs

Suede headliner by Rodney Simpson

Smoothed and painted trim

Billet Specialties steering wheel

Billet pedals

Custom fiberglass console

Pioneer DVD in-dash

Digital Designs Subs, components and amps

Performed by owner

### SPECIAL THANKS FROM OWNER:

To all my family, American Force, Digital Design, Optima Batteries, Katzkin, Negative Camber, Jay Manning, Viair, PPG, T-Rex Grilles, Palace Auto Supply, Extreme Auto Options, Courtney Halowell, Joey Skinner, Rodney Simpson and everyone who supported and helped with the build.



A clean and classy interior is made up of custom Katzkin with alligator inserts, complete Digital Designs audio and a few Billet Specialties pieces to round out the quality cabin.



Under the hood lies an ol' reliable 7.3L Power Stroke. The engine is mostly stock except for a slew of power-coated and chromed parts. The new air filter was undoubtedly added to create clearance for the new rear wheels, necessitated by the lowered stance. (Notice the battery and wiring on the driver side fender has been relocated).



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Joey Skinner with flames by Cole Stevens. From there, it was just a matter of finishing off the interior by fabbing up a center console for the Digital Designs audio system and covering the seats with custom Katzkin leather featuring alligator-style inserts.

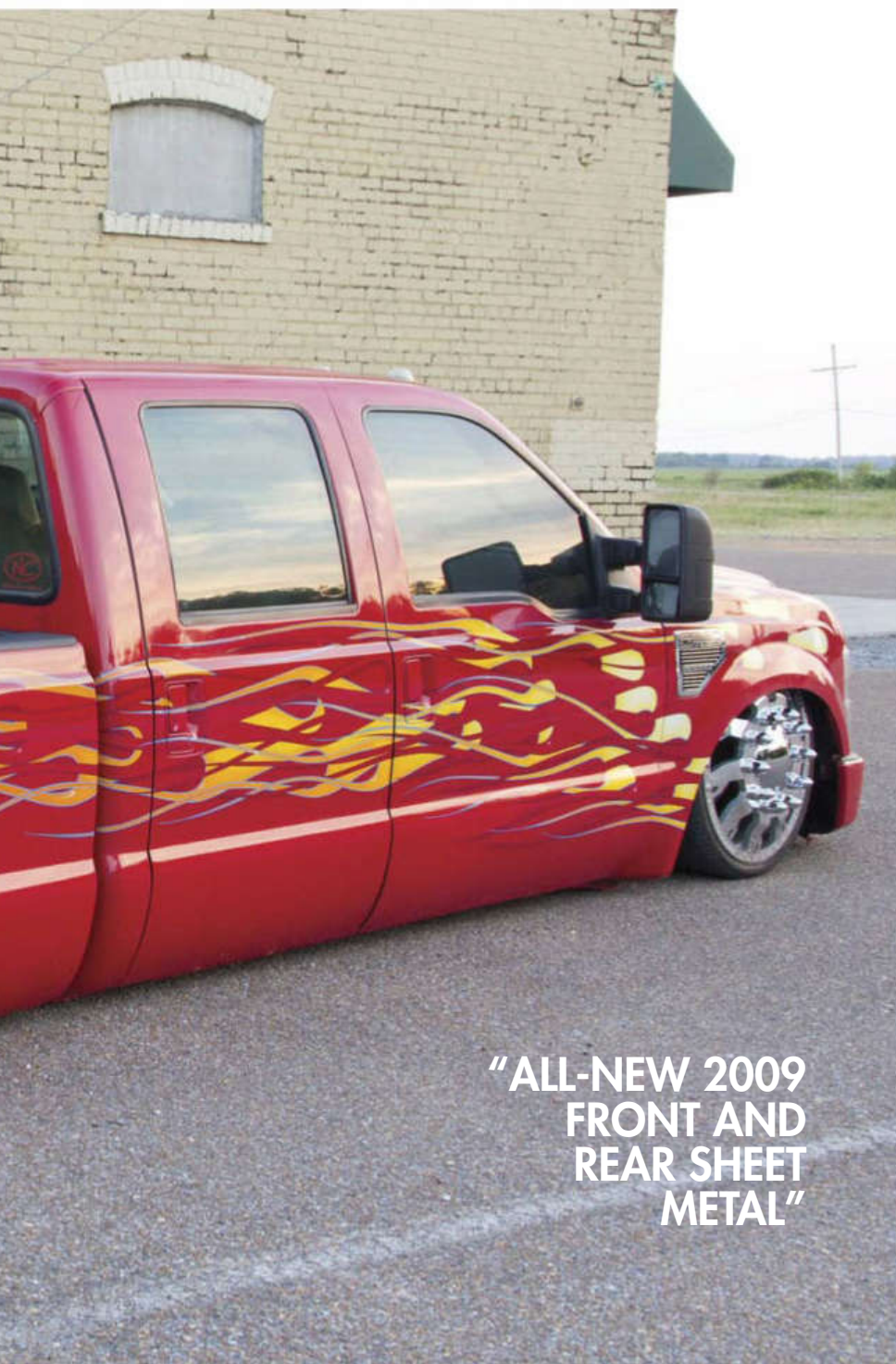
Can you blame him? Sometimes we just can't help ourselves, and every little thing snowballs into something else until we walk into the garage one day to see an award-winning build sitting before us. Some guys have all the luck. We just hope his wife went easy on him. **DW**



A reliable tow worthy air suspension setup was key for this build since its daily duty is to haul.







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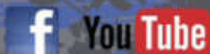
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# The First WD-40

## 1935 McCormick-Deering WD-40

TEXT AND PHOTOS BY JIM ALLEN

**Y**ou're forgiven if "WD-40" brought something else to mind. Before that incredibly useful product was invented, there was an equally useful product with the same name. However, the two products couldn't be more different: They began almost 20 years apart, and one is almost forgotten while the other has grown into a household name. While they both were trendsetters in their respective industries and deserve recognition, we'll let somebody else cover the WD-40 that comes in a can; we'll focus on the WD-40 tractor that was the first wheeled tractor in North America to run on diesel fuel.

### INTERNATIONAL ROOTS

The story starts with the engine, an idea that germinated with International Harvester in the late 1920's. Leonard Sperry in the Gas Power Engineering Department headed up a project to develop a diesel engine for International. The initial goal was to use diesel in their newly developed crawler tractors, a concept which Caterpillar was jealously guarding. In the late 20's, it seemed as if you

even had a dream about a tracked tractor, Cat was gonna take you to court over patent infringement. The IH legal team finally got past that but found they were in a race with Cat over the development of a diesel-powered crawler as well. They lost that race, but not by much. Cat produced their first Model 60 diesel crawler in September of 1931 and International produced the first TD-40 in April of 1932.

Differences? There were many. The Cat 60/65 crawler was a much bigger machine than the IH TD-40 and had a much larger engine, 1,090 ci versus the IH at 460.7 ci. Power differed as well; the big Cat made 87 flywheel horsepower at 700 rpm while the IH developed 50.7 hp at 1,100 rpm. We don't have a flywheel torque spec for the IH but figure the Cat's 720 lbs-ft at 470 rpm probably has the IH beat. Another big



Chuck Lehman's WD-40 is listed as being a 1935. In the driving rail when we shot this, we couldn't find the serial number to verify that, but if it is, then it should be painted grey rather than red. The Harvester #50 red wasn't adopted until 1937 production. Lehman's has the original-style spoked wheels used for the rubber tire option. It has the optional drum PTO as well, from which the Nebraska Tractor Test power rating was taken. Nebraska observed almost 49 hp, but gave it a sea-level rating of almost 52 hp, and that's the rating found on most of the IH literature that came later.

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difference was the starting method. The big Cat used a 2-cyl. gas pony engine and the IH started on gasoline for warm-up and then switched over to diesel. This was extremely innovative for the day. Both diesels started with a hand crank directly, or indirectly, in the case of the Cat's pony engine.

## THE NEW W-40 SERIES

As the TD-40 and it's new diesel were being tweaked, the major upgrades to the McCormick-Deering 22-36 wheeled tractor were being finalized and that new diesel was intended to be in the lineup. Dubbed the W-40 series, the first debuted in October of 1934 as a gasser, and the first diesel rolled off the line on April 16, 1935 with an initial production order of 25 per week and mixed in with many more gas or kerosene engine units. Diesel production soon ramped up as popularity increased. There were three tractors in the W-40 line, the WA-40 gasser, WK-40 kerosene and the WD-40 diesel.

IH had some bugs to work out on several levels. Initially, some air filter problems caused early engine failures but the elephant in the room was the same one faced by all diesel engine manufacturers of the day: short engine life due to poor lubricant quality. Among other issues, the paraffinic Pennsylvania crude oils cause ring and piston failures in as few as 850 hours. The cure came from Chevron, who developed a special oil from a West Coast crude called DELO (Diesel Engine Lubricating Oil). This increased diesel engine life from 1,500 hours to at least 3,000.

As mentioned earlier, the International diesel made 460.7 ci from a 4.75-inch bore and a 6.5-inch stroke. It started on gasoline and then was switched to diesel after warm-up, while it was still running. It did this via auxiliary combustion chambers that were plumbed to a small intake with a tiny carburetor. With the compression release lever pulled back, a valve was opened from the main combustion chamber to the auxiliary, which contained spark plugs fired by a magneto. With the release open, the compression ratio was 5:1, and the engine could be turned over "easily" (so claimed the sales literature) via the hand crank. After



In 1935, the WD-40 had a retail price of \$2,225 (about \$39,000 in 2015 dollars). The WA-40 retailed at \$1,350, so just like today, that diesel power plant added a fair bit to the cost. Lehman's 1935 has a rear shaft PTO, which we think was a later option that a previous owner added in the distant past. Don't ask about comfort options. They didn't exist in this era.

running for a minute or so at 400 rpm on gas, the compression release disengaged, which closed the auxiliary combustion chamber, stopped the fuel to the carburetor and disengaged the magneto. With the compression release disengaged, the injection pump engages and becomes a direct injected diesel with a 17:1 compression ratio. This gas start feature would be present in IH-built diesels to almost 1960. By the way, all the International Harvester tractors were crank start until 1939. The WD-40's gas-powered brother got an electric start in 1939, but the WD-40 diesel never did.



The sharp-eyed among you may see the "gasoline" decal facing the driver. Don't freak. Remember, this tractor started on gas, and as a result, carried 1-1/4 gallons of gasoline in addition to the 31 gallons of diesel fuel. The only gauge was the water temp gauge.

## ACCESSORIES

The W-40 series tractors were the standard tread big boys in the lineup. Bare—the diesel weighed in at 7,550 lbs. on steel wheels though working weight was more like 8,500 lbs. And yes, the W-40 was offered with both steel wheels and rubber pneumatic tires. Rubber tires were still a fairly big deal in the mid-30's, but with the normal 32 steel lugs per wheel, the steel probably beat the rubber for traction, even if you were spitting out teeth to make the rated 4 mph top speed. On rubber tires, the top speed was 12 mph: fast for the day. The



The legendary "Armstrong" starter from the days before Mr. Kettering's electric starter had been applied to many farm tractors. In watching owners start these, we can say it actually doesn't look all that bad. Easily said by the one not doing it, of course, but swinging over a 461 cubic-inch engine by hand...how hard can it be?



tractor used a 3-speed transmission, and the gearing was different between the rubber and steel tractors.

The standard WD-40 tractors had the

stuff that was considered important for the day, a temp gauge, seat and fenders. The seat was a pressed steel bucket with no back. Optional was a drum PTO, swinging

drawbar, exhaust muffler, plus a lot of attachments for just about any type of farming. The four cylinder WD-40 tractors were a little behind the six-cylinder W-40 gas



The WDC diesel was International's first and had nearly three years of service in the TD-40 crawler behind it by the time it debuted in the WD-40. It developed 51 flywheel horsepower from its 461 ci at a "screaming" 1,100 rpm. We don't have a manufacturer's torque rating, but we assume it had about 245 lbs-ft at that same rpm and likely quite a bit more at a lower rpm. The housing in front of the IH injection pump is a fuel filter. These pumps are getting tough to rebuild, and parts are scarce, but there are still experts out there that specialize in them.

If you are not a "red tractor" person, you may be confused with the interchanging of "International Harvester" and "McCormick-Deering" in this story. The McCormick-Deering tractors were products built by International Harvester. International Harvester was formed by the merger of the McCormick Harvesting Machine Company and the Deering Harvester Company in 1902, both of which were developing internal combustion engines and tractors at the time of their merger. Both were prestigious companies with lots of name recognition, so McCormick-Deering was a name that worked to bring fans of both to the company, plus settle a monopoly issue with the government over keeping two separate companies. By the end of the 1930's, the McCormick-Deering badged tractors became fewer and the International Harvester or McCormick branded tractor began becoming more prevalent. By the late 1950's, in the USA at least, the McCormick branded tractors were also gone.

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and WK-40 kerosene/distillate tractors as far as power is concerned (about a horsepower) but way ahead on fuel economy.

The WD-40 engine featured three main bearings and early on had poured babbitt

bearings. Around 1937, they adopted cop-per-backed insert bearings. That year, the injector angle was also changed. The engine was dry-sleeved, had a pressurized lubrication system with an oil filter and used

an injection pump designed and built by International.

The WD-40 was

produced until 1940 and was replaced by the much-improved WD-9, which replaced it in the lineup as the big standard tread tractor. Total production of the W-40 line is listed at 10,059 with some 3,400 being WD. The WD-40 was a history-making tractor and one that helped push diesel into the mainstream of farming and commercial use in general. **DW**



We've discussed the incongruity of seeing a magneto, carburetor and spark plugs on a diesel before, but it never fails to make those unfamiliar with the diesel's thrilling days of yesteryear scratch their heads. The carburetor is tiny and is just large enough to operate the engine at a high idle for warm-up. The WD-40 didn't come stock with a muffler, and they aren't terribly loud at their normal 850-1100 rpm operating speeds. The manual says they were rated for up to 1,200 rpm. Hang on to your hat, Mabel!

## TYPICAL SPECIFICATIONS:

### 1935 McCormick-Deering WD-40

|                               |                         |
|-------------------------------|-------------------------|
| <b>ENGINE:</b>                | International WDC       |
| <b>DISPLACEMENT:</b>          | 460.7 ci                |
| <b>BORE &amp; STROKE:</b>     | 4.75x5.5 in.            |
| <b>*RATED BELT PTO POWER:</b> | 48.79 hp @ 1100 rpm     |
| <b>*RATED DRAWBAR POWER:</b>  | 36.52 hp @ 1100 rpm     |
| <b>COMPRESSION RATIO:</b>     | 17:1                    |
| <b>TRANSMISSION:</b>          | 3-speed                 |
| <b>WEIGHT:</b>                | 7,550 lbs               |
| <b>TIRES:</b>                 | Front- 34x6 steel       |
|                               | Rear- 50x12 steel       |
|                               | Front- 7.50-20 rubber   |
|                               | Rear- 12.75-20 rubber   |
| <b>*FUEL CONSUMPTION:</b>     | 3.35 gph @ full power   |
| <b>FUEL CAPACITY:</b>         | 31 gal.                 |
| <b>*DRAWBAR PULL:</b>         | 4,774 lbs. @ 5.45% slip |
| <b>*TOP SPEED:</b>            | 3.9 mph (steel)         |
|                               | 12.4 mph (rubber)       |

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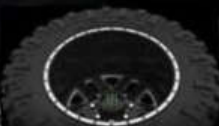




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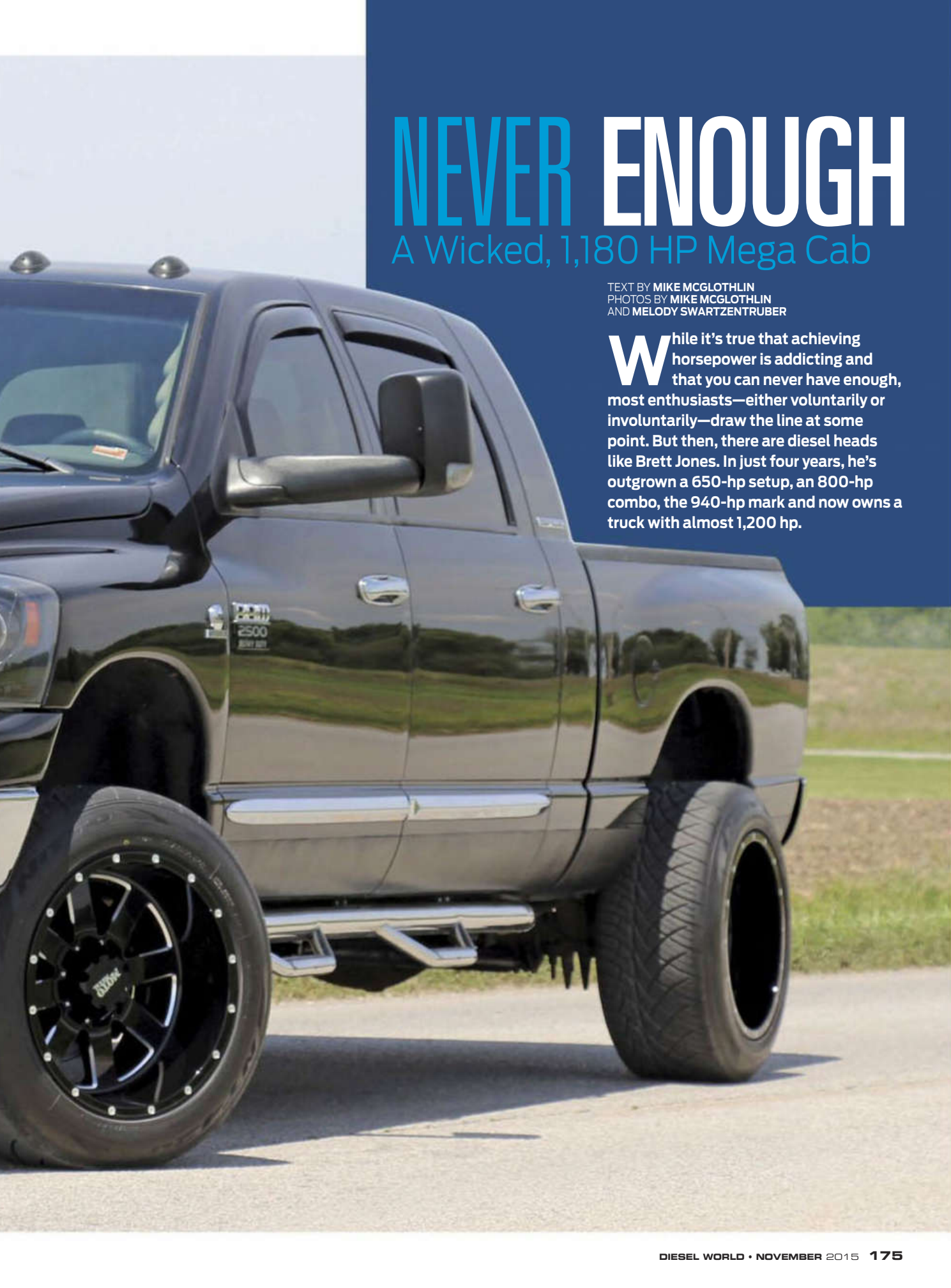
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- ✓ Free Caps











# NEVER ENOUGH

A Wicked, 1,180 HP Mega Cab

TEXT BY MIKE MCGLOTHLIN  
PHOTOS BY MIKE MCGLOTHLIN  
AND MELODY SWARTZENTRUBER

**W**hile it's true that achieving horsepower is addictive and that you can never have enough, most enthusiasts—either voluntarily or involuntarily—draw the line at some point. But then, there are diesel heads like Brett Jones. In just four years, he's outgrown a 650-hp setup, an 800-hp combo, the 940-hp mark and now owns a truck with almost 1,200 hp.



# NEVER ENOUGH

With the family cattle farm (in addition to being a full-time union electrician), Brett wanted a Ram with Cummins power under the hood; he was also fond of manual transmissions, so when he located this '07 Mega Cab a few years back, and it was equipped with a G56 six-speed, plans for a simple family vehicle were left behind.

## EARLY MODIFICATIONS

Modifications began with an S475 over-stock compound turbocharger arrangement, head studs, fuel system and clutch upgrade. After living in the 650-hp range for a bit, the hunger for more power led to more fuel, which brought the truck up to the 800-hp mark. Soon after, however, the factory G56 gearbox met its fate. Brett decided to cryogenically treat his next G56 and realized it was an opportune time to reinforce the bottom end before he pushed things any further.

With a trip up to Midwest Truck Products in Cantril, Iowa, a plan was devised to build a competition-ready 5.9L on a reasonable budget. A set of balanced 12-valve rods got the go-ahead, along with ARP main studs and a Gorilla girdle from Industrial Injection. Cast-aluminum Mahle pistons, sized 0.020-inch over, thermal coated up top and hit with dry film lubricant on the skirts, got the nod as well. The last order of business in the block was the addition of Midwest's Stage 2 camshaft in place of the factory unit.

**"1,181 HP AND  
1,647 LB-FT OF TORQUE  
AT THE REAR WHEELS"**



Built by Midwest Truck Products in Cantril, Iowa, the 5.9L Cummins in Brett Jones' '07 Dodge 2500 is currently producing 1,181 hp at the rear tires. The common rail's bottom end benefits from a Gorilla girdle, ARP main studs, balanced 12-valve rods, and coated 0.020-inch over Mahle cast aluminum pistons. An O-ringed head fitted with oversize valves, 110-pound valve springs, chromoly push rods, and ported to the hilt is anchored to the block with A1 Technology H11 head studs.



Big power calls for big turbos, so after building the engine, the guys at Midwest Truck Products sized a pair of S400-based BorgWarner chargers and fabricated all of the appropriate plumbing. The atmosphere turbo features a billet 84mm compressor wheel, the common 96mm turbine wheel, and 1.32 A/R exhaust housing and utilizes a T6 flange. The manifold charger is comprised of a 64mm billet compressor wheel, 83mm turbine wheel, .90 A/R exhaust housing, and mounts to an ATS T4 exhaust manifold.



To ensure the atmospheric turbo makes its fair share of boost, a 50mm JGS Precision external wastegate routes exhaust gasses into the S484 to drive it harder under wide open throttle. The S484/S464 compound arrangement makes 75 to 80psi of boost on the street.





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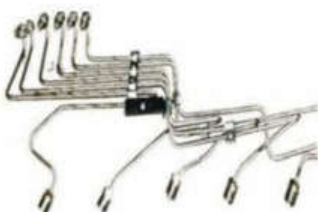
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**SPECS:****Year/Make/Model:****2007 Dodge Ram 2500 Mega Cab****OWNER:** Brett Jones**HOMETOWN:** Green Castle, Missouri**ODOMETER:** 131,000 miles**ENGINE:** 5.9L Cummins common-rail with 12-valve rods, coated 0.020 over pistons, Gorilla girdle, ARP main studs, Midwest Truck Products Stage 2 cam, O-ringed head and block, Premier Engine Design ported head with 110-lb valve springs, Trend Performance Stage 2 chromoly push rods, H11 head studs**FUEL:** 200-percent over Exergy Performance injectors, Exergy Performance Sportsman CP3 over an Exergy 12mm CP3, AirDog 200-gph fuel system**AIR:** Midwest Truck Products compound billet S484/S464 turbos, 50mm JGS Precision wastegate, Joker Fabrication side draft intake manifold, reinforced BD intercooler**TRANSMISSION:** Firepunk Diesel Comp 3 48RE automatic with billet input, intermediate and output shafts, PCS stand-alone transmission controller, B&M floor shifter**TUNING:** StarLite Diesel Efilive via CSP5 switch**HORSEPOWER:** 1,181 hp (dyno proven)**TORQUE:** 1,647 lb-ft (dyno proven)**TIRES:** Nitto 420S 305/50R20**WHEELS:** 20x12 Moto Metal 962**DRIVELINE MODS:** Eaton ELocker (front), Grizzly locker (rear), Yukon front chromoly axle shafts (inner and outer), Yukon 38-spline rear axle shafts, Columbus Joint and Clutch 5-inch heavy-wall aluminum rear driveshaft with 1550 Spicer U-joints, traction bars

Both the block and head were cut to accept O-rings for utmost combustion sealing and street longevity. The head was worked over by Premier Engine Design, and it was ported as far as a common-rail head can be and still retained water jackets. From there, the head was fitted with oversize valves and 110-pound valve springs, utilizing a

24-valve style head gasket and fastening to the block via 12mm H11 studs from A1 Technologies.

**COMPOUNDS AND MORE FUEL**

Producing 80psi of boost is a set of S400 compound turbochargers built by Midwest Truck Products. Both turbos feature billet compressor wheels,



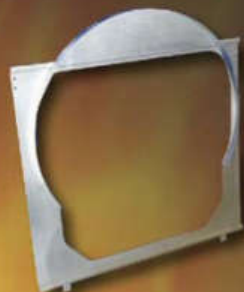
Out of a reinforced BD Diesel intercooler, a high-flowing side-draft intake manifold from Joker Fabrication directs 80 pounds of boost into the ported common-rail head. This photo was taken prior to the truck being fitted with a second, belt-driven CP3.





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with the manifold unit getting a 64mm and the atmospheric charger an 84mm. An external wastegate on the exhaust manifold feeds the S484 for a harder drive rather than venting to the atmosphere. Fueling mods initially included a set of 100-percent over injectors and a 12mm CP3 from Exergy Performance.



Tying all modifications together was left in the hands of Zach Fuller at StarLite Diesel. Through use of EFILive software and five tunes available via a CSP5 switch, Brett has a truck that makes incredible power, is street friendly, and can still knock down 16mpg on the highway.

## "BOTH THE BLOCK AND HEAD WERE CUT TO ACCEPT O-RINGS"

The latter combination of parts yielded 936 hp on the chassis dyno. Then, a set of 200-percent over Exergy Performance injectors, a Firepunk Diesel 48RE automatic, a 200-gph AirDog fuel system, and a second CP3 was added, and as you can imagine—all hell broke loose in the power department. The truck now makes 1,181hp



Thanks to a second CP3, Brett is able to take full advantage of the 200-percent over Exergy Performance injectors he's running. A 12mm Exergy pump resides in the factory location. With the belt-driven Sportsman pump (also from Exergy) in the mix, more than 200 additional horses were gained over running just the 12mm unit.





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**"I HAD THE G56  
INTERNALS CRYO'D  
AND WAS TOLD IT  
WOULD HOLD 1,000  
HP—BUT I KNEW I WAS  
EVENTUALLY GOING TO  
BE MAKING MORE  
THAN THAT."  
—BRETT JONES**

and 1,647 lb-ft of torque at the rear wheels.

From top to bottom, Brett's Dodge was built to handle the whopping amounts of horsepower and prevent catastrophic failure to the engine: Adding front and rear lockers, stronger axle shafts, 1550 series rear U-joints, and a Firepunk Diesel 48RE helps push out four-digit horsepower safely. While it's never safe to say any 1,200 hp truck is indestructible, we're pretty confident that Brett's Mega Cab is as close as it gets. **DW**



Originally equipped with the G56 six-speed manual, Brett knew it was time to switch to an automatic once the truck was on the verge of making four-digit horsepower. So, he had the guys at Midwest Truck Products yank the hand-shaker and swap in what has become arguably the toughest Dodge transmission in the industry: a Comp 3 48RE from Firepunk Diesel. A B&M shifter makes good use of covering the hole left in the floor from the G56, and it bolted right up to the 48RE transmission's case.



Sending a steady stream of diesel to the CP3s is a 200-gph fuel system from AirDog. Brett keeps an eye on lift pump pressure via an Isspro fuel pressure gauge mounted along his A-pillar.



Once in the cab, most folks immediately notice how nicely done the leather seats are (they were reupholstered by leatherseats.com). However, the first thing we spotted was the radar detector sitting on the dash. After all, if you own a truck that makes 80psi of boost, more than 1,100 hp, and is capable of running 10's, you might want to know when the boys in blue are nearby.



Beefing up the driveline is a 5-inch heavy-wall aluminum rear driveshaft from Columbus Joint & Clutch out of Grove City, Ohio. This serious piece of hardware incorporates 1550 series Spicer U-joints, which are typically only seen on rigs in the truck-pulling world.



With the main goal behind the build being to make gobs of horsepower, a secondary mission was to minimize breakage. An Eaton ELocker up front and a Grizzly locker in the rear help maximize traction, while chromoly 38-spline axle shafts from Yukon strengthen the AAM 1150 out back. The front AAM 925 was also fitted with chromoly axle shafts.



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## Bogging Issues

Hey there, I have a 1997 Chevy pickup with a 6.5L diesel, and I'm having some issues, such as a lack of power when pulling my fifth wheel trailer, resulting in the engine-service light coming on. Also, when climbing into mountain passes, she bogs down, and it seems like the engine is starving for air (without the trailer on). So, I took it to a local diesel shop and was told that the trouble code indicated a lack of air or possibly an air leak. I can't locate an air leak, so I'm at a loss. Can someone help me!

Thanks,

**Barbara Wickes**  
Via Email

Hey Barbara,

*Sounds like a turbo boost pressure problem, most likely a DTC-P0236, Turbo Wastegate Solenoid Fault.*

*The Diagnostic Trouble Code P0236 (1996+) is a somewhat common trouble code affecting the electronically injected 6.5L turbo diesels. Typical symptoms of a boost-related problem include an SES (Service Engine Soon) lamp illuminating when the engine is operating somewhere at or above 2,500 rpm and when accelerating. The SES lamp will usually go out once you slow down or reduce throttle. You may also experience a loss in power and see more black smoke out of the tailpipe.*

*With the engine at idle, the vacuum should be holding the wastegate actuator control rod on the turbocharger closed, and it should take considerable finger pressure to move it open. If the wastegate lever is easily moved, you have a loss of vacuum or a problem with the vacuum control system – namely the Wastegate Solenoid.*

*With the engine off, you should be able to move the wastegate actuator control rod up and down fairly easily. A sticky wastegate (due to rusting) can be a problem if vehicles aren't driven for long periods of time in a moist environment. For any boost-related problem, always begin your troubleshooting by measuring the vacuum at the wastegate actuator on the turbo with the engine idling. While most systems will produce approximately 20 inches of vacuum, GM specifies 15 inches of vacuum as the minimum.*

*With that said, they're the two most reported failures that cause what you're reporting: a bad Wastegate Solenoid or a leaking vacuum line. The most likely cause is the wastegate solenoid (mounted to a bracket above the driver's side valve cover). The vehicle Powertrain Control Module (PCM) modulates the amount of vacuum seen at the wastegate actuator on the turbocharger by controlling this solenoid. The computer turns it on and off many times per second using a modulated square wave. The plastic vacuum lines snaking across the engine become brittle over time and are easily broken. You can bridge a break with neoprene vacuum hose. Easy fix. Good luck.*

## Diesel Motor Oil

I am a parts manager at a Chevrolet dealership. I have a question for you regarding CI-4 motor oil availability. Here is a little background—I used to buy the 15W-40 CI-4 oil from GM—till a few years ago. They discontinued that product and recommended we use the more expensive API rated CJ-4 to replace it. My service manager and I

decided to spec out some new CI-4 oil for our customers who still drive the 2007 classic and earlier diesels (non exhaust particulate filter equipped). It has been suggested that the earlier CI-4 or CI-4+ oil was better suited for these "older" applications, and it is cheaper. We had been using the Exxon XD-3 CI-4 oil until I recently learned that it is no longer available.

My questions: Is all CI-4 oil being discontinued and replaced by CJ-4? Do you know of any manufacturers that are continuing to produce CI-4 oil? Should I spend my time finding a CI-4 oil only to have it be discontinued within a few months? I was told that the CI-4 or CI-4+ is better suited for the 2007 old style and older diesels by an aftermarket synthetic oil rep, do you agree with this statement? My goal here is to provide my customers with quality oil at the best price I can get it for.

Thanks for your time,

**Frank Blant**  
Via Email

*Good questions, Frank.*

*All players in the motor oil business have upgraded their diesel-rated motor oils to include the newer CJ-4 API rating. Unless you find some old stock, you'll not likely locate a diesel motor oil that doesn't include CJ-4.*

*The Duramax can run from 5,000 to 7,500 miles between service intervals, which shouldn't produce a huge impact on service costs, even with the slight increase in the cost of CJ-4.*

*Whether ad hype or not, the major motor oil companies advertise a number of benefits when using CJ-4 in any diesel engine when compared to the earlier CI-4 oil, whether or not it's equipped with a diesel exhaust particulate filter. I recommend the newest oils.*

## 3,000 RPM = More Performance?

Hiya Jim,

I have a question about performance, and I thought you might have some advice. First, I'll tell you that I have a 2005 Dodge, which has an AFE Stage II cold air intake system, MBRP 4" Cool Duals exhaust, FASS fuel system, and TST performance module. I myself also installed a performance clutch and had the transmission checked out.

It runs fine now, but I want a little more. The one thing I have noticed is that it only pulls hard to about 2,500-2,600 RPM then flattens. If the engine would pull hard all the way to 3,000 or above, I believe performance could be better. What do you suggest?

Thanks,

**Bart Gorecki**  
Omaha, Nebraska

Hi Bart,

*At least four factors combine to shape the power and torque curves produced by these engines – boost pressure curve, diesel injection fuel-rate curve, bore and stroke geometry and the basic thermodynamics of diesel fuel combustion. Learning a little more about how the Dodge Cummins and light-truck diesels in general operate might help to explain what you're seeing.*

*A turbocharger can be thought of as a torque adder. Generally, the engine's torque curve closely matches the boost pressure curve across*





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the engine RPM range. If you can alter the boost pressure curve to come in sooner or later, the engine's torque curve will also come in sooner or later. Raise the overall boost pressure, and the engine's torque curve will increase overall, provided you make changes to increase fuel delivery.

Most diesel fuel injection systems used by light trucks today provide their highest fuel-rate at somewhere around 2,000 RPM, which

then tapers off at higher engine speeds. The maximum fuel rate is not uniform across the entire engine RPM range. This is done by the diesel fuel system manufacturers, in part, as an acknowledgement that diesel fuel needs time to burn efficiently in the combustion chamber. Time becomes shorter as engine speed increases.

The comparatively long stroke and long connecting rods of the Cummins work best at

producing torque at a lower engine speed than a gas engine might. The V-8 diesels used by Ford and GM use a bore/stroke ratio closer to 1-to-1. The effect of this is that the V-8 geometry can result in a somewhat higher RPM torque and power peaks, and that the Cummins is more efficient when spinning a little slower. This isn't a suggestion concerning which is better, but an acknowledgement of the design, which can be useful when defining powertrain management for best towing performance, track performance, or fuel economy. For illustration purposes, the Dodge 6.7L Cummins was originally rated at 350 hp at 3,000 RPM and 650 lb-ft torque at just 1,500 RPM. Of course, gas engines have horsepower and torque peaks much closer together.

- Dodge 5.9L Cummins –  
Bore 4.00 x Stroke 4.72"
- Dodge 6.7L Cummins –  
Bore 4.21 x Stroke 4.88"
- Ford 7.3L Power Stroke –  
Bore 4.09 x Stroke 4.17"
- Ford 6.4L Power Stroke –  
Bore 3.74 x Stroke 4.13"
- Ford 6.7L Power Stroke –  
Bore 3.90 x Stroke 4.25"
- GM Duramax 6600 –  
Bore 4.05 x Stroke 3.89"
- GM/AMG 6.5L –  
Bore 4.06 x Stroke 3.82"

Through the years, I've seen 1,800 RPM quoted time and time again as the best engine speed for maximum diesel fuel economy and which has been proven time and time again by industry tests. This isn't a coincidence but rather a statement about the thermodynamics of compression ignition and light-truck diesel engines in general. Whether Dodge, Ford, or GM, all produce the best fuel economy when operated somewhere near 1,800 RPM (depending on the load). Incidentally, you'll also find the same RPM relationship when working with any of the newest automotive diesels, like the Chevy Cruze or Volkswagen diesels.

Now, taken together, all of these factors combine to produce a Dodge Cummins diesel that produces the best combination of power and torque (performance) in the 2,600 to 2,800 RPM range—whether on the dyno or at the track. Dodge has widened the engine's

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RPM operating range considerably through the years due to its adoption of electronic diesel fuel injection. The first-gen mechanically injected Dodge Cummins operated at a maximum governed engine speed of 2,700 RPM, while the current governed engine speed has increased to 3,500. Dodge did this to improve drive-ability. But, best performance remains in the 2,600 to 2,800 RPM window, even now with the new high-pressure common rail fuel injection.

So, to improve Dodge Cummins performance above 2,800 RPM, you'll need a boost/fuel program that attempts to maintain the fuel-rate and boost pressure through 3,000 RPM or higher. This is where a variety of stock parts begin to struggle.

The factory turbocharger can't efficiently provide that peak boost pressure much above 2,800 RPM. It'll go higher, but efficiency begins to affect engine performance. The compressor efficiency struggles at higher airflows and pressures, which creates higher boosted air temperatures. Higher boosted air temperatures increase combustion temperatures and reduce air density. You lose one horsepower for every 10 degrees increase in intake air. The variable nozzle turbine, which was designed for typical drive-ability and to maintain low emissions becomes increasingly restrictive to exhaust flow at higher engine speeds and exhaust flow rates. This can cause exhaust temperature to increase above the safety zone when making more power, and is made worse by an increasingly hot intake air. This is why aftermarket turbochargers and more efficient intercoolers are popular with owners who modify their trucks for better performance.

Monitoring fuel-rail pressures while making big power can tell you whether you need a second CP3 high-pressure fuel pump, a performance-oriented lift pump, larger fuel supply lines, or all of the above. Use a scan tool to look at the "commanded" and "actual" fuel rail pressures during a run down the track or while on the dyno. If less than about 10-kPa pressure differential can be maintained at maximum power, you should be fine.

As a way of providing a little more background for this mystical 2,600 to 2,800 RPM diesel phenomenon, some modified Duramax engines running highly specialized programming can spin to as high as 5,000 RPM. This

can be advantageous to allow stretching out lower differential gearing in the ¼-mile or at Bonneville, but again, the best modified engine performance remains in the 2,600 2,800-RPM range – even for the Duramax. It pulls harder at the track or on the hill in that RPM range.

Generally, it's not wise to stack more than one fuel injection timing device due to the possibility for unexpected consequences. Too

much timing advance can be harmful to the engine. Talk to TST as well as the various performance vendors advertising here in Diesel World. They'll be able to help you choose products that are stackable or provide products that meet, or come closer to, your expectations. Let us know what develops with your truck upgrades. Interesting subject. Thanks for writing. **DW**



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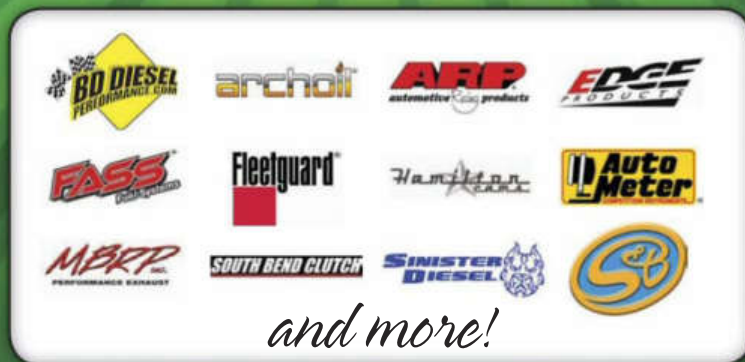
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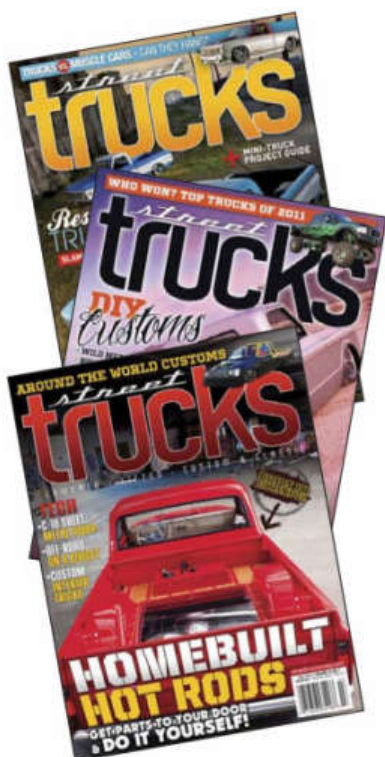
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MAKE EVERYDAY AN  
**ADVENTURE**

## TERRA GRAPPLER<sup>®</sup> G2

The Terra Grappler G2 is Nitto's next generation all-terrain light truck tire specifically designed to meet your everyday on and off-road adventures. Whether you're commuting to work, towing a trailer or headed up your favorite mountain trail, the balanced off-road and on-road performance of the Terra Grappler G2 will get you to your destination.

Featuring a distinctive tread pattern, a brand new compound, and improved internal construction, the Terra Grappler G2 offers increased treadlife\* and true all-terrain capability.

\*Comparison against the original Nitto Terra Grappler.

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**50K & 65K**

FOR LT METRIC SIZES

FOR HARD METRIC SIZES

See Nitto Tire's warranty manual for full terms and conditions

